2012

Programmable Logic Controller (PLC) Based Traction Controller User Manual

VIRGINIA CONTROLS

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1. Pre-Installation Instructions and Notes

1.1 General Notes

It is strongly recommend that you read this manual carefully before proceeding with the installation.

Important information is highlighted by the headings WARNING, CAUTION, or NOTE. These words are defined as follows:

WARNING - Warnings are used to indicate instructions which, if not followed correctly, will probably result in personal injury or substantial damage to equipment.

CAUTION - Cautions are used to indicate instructions or information which, if not observed, may result in some damage to equipment if care is not taken.

NOTE - Notes are used to indicate instructions or information which is especially helpful in understanding and operating the equipment, and which will usually speed up the installation process.

1.2 Important Precautions and Notes

The following general rules and safety precautions must be observed for safe and reliable operation of your system.

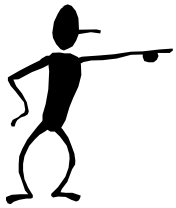
WARNING: If you need to change the EPROM program chip on the CPU, make sure you read the instructions and know exactly how to install the new chip. Plugging the EPROM chip in upside-down may damage the chip. Static electricity can damage the EPROM, so avoid touching the pins on the chip, and ground yourself (by touching the controller cabinet) before touching the chip or the controller. Do not expose the EPROM program chip to bright light, and do not remove the label over the EPROM program chip window.

WARNING: The elevator controller must be installed by experienced field installation personnel. The field installation personnel must know and follow all the rules and regulations pertaining to the safe installation and running of elevators. Additional information for specific devices (such as the door operator, etc.) is the responsibility of the manufacturers of those devices.

WARNING: This equipment is designed and built to comply with ANSI A17.1, ASME A17.5 and CAN/CSA B44.1 and must be installed by a qualified contractor. It is the responsibility of the contractor to make sure that the final installation complies with all applicable local, state and national codes, and is installed safely.

WARNING: The 3 phase AC power supply to this equipment must come from a fused disconnect switch or circuit breaker which is sized in accordance with all applicable national, state and local electrical codes, in order to provide the necessary branch circuit protection for the controller and motor. Incorrect motor branch circuit protection may create a hazardous condition.

WARNING: Proper grounding is vital for the safe operation of your system. Bring the ground wire to the ground stud that is labeled "GND" or "G". You must choose the proper conductor size. See national electrical code article 250-95, or the related local applicable code.



Pay special attention to points highlighted in this manner. They are of special consideration and are frequently overlooked.

2. Controller Installation and Wiring

2.1 Controller Installation

2.1.1 Controller Location Selection and Environment

Mount the controller in a location that provides:

- adequate support for the weight of the controller,
- adequate lighting for installation and maintenance,
- convenient access for the routing of required conduits and cables,
- convenient access to other devices in the machine room,
- a minimum of vibration (supply additional bracing or reinforcement if required).

For improved controller reliability:

- Keep the machine room clean.
- Do not install the controller in a dusty area.
- Do not install the controller in a carpeted area, or area where static electricity is a problem.
- Keep room temperature between 0°C to 50°C (32°F to 122°F), and 95% non-condensing relative humidity. Extended high temperatures will shorten the life of electronic components. Provide adequate ventilation or air-conditioning as required if necessary.
- Avoid condensation on the equipment. Keep the controller away from sources of condensation and water (such as open windows) as these can create a hazardous condition and can damage the equipment.
- Do not install the controller in a hazardous location and where excessive amounts of vapors or chemical fumes may be present. A NEMA 12, NEMA 4 or NEMA 4X rated enclosure can be provided if necessary.
- Make sure power line fluctuations are within ±10%.
- High levels of radio frequency emissions may cause interference with the controller Microprocessor, and produce unexpected and even dangerous results. This could be caused by hand-held communications devices used near the controller.

2.1.2 Controller Grounding

Grounding of the controller must conform to all applicable codes. Proper grounding is essential to the safe operation of the equipment. It will also reduce the likelihood of noise-induced problems, which could include CPU crashes, or I/O communication errors.

- The grounding wire should be sized per the applicable codes.
- Connect the ground to a good building ground, such as the structural steel of the building, or a cold water pipe.

2.2 Car and Hoistway Wiring

Review the schematics and field wiring diagrams before attempting to hook up the controller.

2.2.1 Floor Switches

The Floor Switches, if used, are normally open contacts that should close under each of the following conditions:

1. the car is at the slowdown point above the floor, OR
2. the car is at the slowdown point below the floor, OR
3. the car is at the floor (optional), OR
4. the car is between the up and down slowdown points of that landing (optional).

Conditions (1) and (2) are required to change the floor relays and initiate slowdown. Condition (3) is required at the terminal landings, but is optional at the intermediate landings. Condition (4) is optional.

There are many acceptable methods of providing the floor switch signals, such as by having a single Floor Switch at floor level, and an adjustable length cam on the car, or by having two Floor Switches per floor, and a fixed length cam on the car. The Floor Switches may be mounted on the car if they are in separate rows. It is recommended that the method used allow for separate adjustment of the up and down slowdown distances.

NOTE: Recommended slowdown distance is about 6" for every 25fpm of car speed, for speeds of up to 200fpm. Minimum recommended target length for the floor switches is 1".

If there are short floors, refer to the schematic for special instructions, if required.

NOTE: The terminal landing Floor Switches must be maintained while the car is within door zone of the terminal landing.

2.2.2 Car Top Selector

The pulsing-type Car Top Selector provides Floor Change/Slowdown signals and Leveling signals, as shown on the car top selector sheet in the schematic. The signals should be a normally open contact that closes as described below.

1. UP SLOWDOWN closes at the Slowdown distance below the floor. This signal is repeated for each speed required for faster cars, or for short floor conditions. (Refer to the schematic)
2. DOWN SLOWDOWN closes at the Slowdown distance above the floor. This signal is repeated for each speed required for faster cars, or for short floor conditions. (Refer to the schematic)
3. UP and DOWN LEVEL, and DOOR ZONE/LOW LEVEL. (See "Leveling Sws")

NOTE: Recommended slowdown distance is about 6" for every 25fpm of car speed, for speeds of up to 200fpm. Minimum recommended target length for the floor switches is 1".

An extra reset target is required at each terminal landing, as shown on the schematic, so that the Up Slowdown Switch is closed when the car is in the leveling zone at the top landing, and the Down Slowdown Switch is closed when the car is in the leveling zone at the bottom landing. These targets are used to reset the floor position at the terminal landings.

If full speed is not achieved on a one floor run, then additional slowdown signals may be required for different speeds. This may apply to high speed cars, or to installations with short floors. Refer to the Selector installation sheet in the schematic for the exact requirements for the selector for each particular installation.

2.2.3 Leveling Switches

The Up Level Switch is a normally open contact that closes when the car is in the leveling zone below the floor, and the Down Level Switch is a normally open contact that closes when the car is in the leveling zone above the floor. Adjust the distance between the Up Level Switch and the Down Level Switch to be equal to the length of the leveling vane/target plus the desired Dead Zone distance (usually 1/4" to 1/2"). The actual length of the leveling target is not critical (except in some short floor situations) and is usually 6-10". Position the leveling vane/target so that when the car is floor level the Up and Down Leveling Switches are centered around the vane/target, and both switches are open.

The Door Zone Switch is a switch (or switches) activated by the leveling vane/target when the car is within 3" of floor level. If the leveling vane/target is 6" long, then only one switch is required, mounted between the Up and Down Leveling Switches, otherwise two switches wired in series should be provided.

2.2.4 Terminal Landing Normal Slowdown Limit Switches

The Terminal Landing Normal Slowdown Limit Switch is a normally closed contact that opens when the car is closer to a terminal landing than the minimum slowdown distance. It will prevent the car from running into the terminal landing at full speed. It should be adjusted to open approximately one inch beyond the point where the normal slowdown (from the floor switches or the car top selector) is initiated.

2.2.5 Terminal Landing Normal Limit Switches

The Terminal Landing Normal Limit Switch (sometimes called a Directional Limit Switch) is a normally closed contact that opens when the car has traveled 1" past floor level at a terminal landing. The car should not be on the Terminal Landing Normal Limit Switch when the car is

floor level at the terminal landing. The Limit Switch will prevent the car from traveling further away from the normal area of car travel, but allows the car to run back towards the normal area of car travel.

2.2.6 Terminal Landing Final Limit Switches

The Terminal Landing Final Limit Switch, where required by code, is a normally closed contact that opens when the car has gone a considerable distance beyond floor level at a terminal landing. It will prevent any further movement of the car in either direction. Consult the applicable codes for the proper setting of this switch.

2.2.7 Emergency Terminal Landing Limit Switch

The Emergency Terminal Landing Slowdown Switch should be installed as required by the applicable codes. It is a normally closed contact that opens after the car has gone beyond the Terminal Landing Normal Limit Switch.

2.2.8 Hoistway Access Zone Switches

The Hoistway Access Limit Switches limit the motion of the car on Hoistway Access, by disabling the car if it moves away from the access floor. Install the zone switches to stop the car from running down if the top of the car goes below floor level at the top access floor, and to stop the car from running up if the car goes above the second floor while on Hoistway Access at the bottom floor.

2.2.9 Door Open and Close Limit Switches

The Door Open Limit Switch is open when the doors are fully open, and closed at all other times. It will de-energize the door open relays in the door operator when the doors have opened fully.

The Door Close limit Switch is open when the doors are fully closed, and closed at all other times. It will de-energize the door close relays in the door operator when the doors have closed fully.

NOTE: Many problems in operation can be attributed to failures in the Door Open or Close Limit Switches (including long door times, improper door operation on Fire Service, inability to go on to or to clear Fire Service, etc.) Always check the Door Open and Close Limit Switches if unusual operation of the elevator is observed.

NOTE: It is recommended that the Door Close Limit Switch be adjusted so that, as the doors are closing, the Car Door Contact closes before the Door Close Limit opens. Consult the Door Operator Manufacturer's installation instructions for further details on the adjustment of the doors.

NOTE: 2000 (or later) code compliant controllers will not run without the Door Close Limit operation properly.

NOTE: If a solid state door operator unit is being used, check the appropriate schematics to see if any changes are required on the actual operator. These may include changing resistors in the operator, and adding a diode for proper open and close torque.

2.3 Machine Room Wiring

Mount the controller firmly and install all required conduits before wiring the controller. Note where duct has been provided in the controller for customer access, before deciding where to locate conduit openings.

WARNING: Do not allow any metal shavings to get into relays or contactors, or in or behind the electronic components, as these could cause serious damage to personnel or the equipment.

2.3.1 Incoming Power

WARNING: The 3 phase AC power supply to this equipment must come from a fused disconnect switch or circuit breaker which is sized in accordance with all applicable national, state and local electrical codes, in order to provide the necessary overload protection for the controller and motor. Incorrect motor branch circuit protection may create a hazardous condition.

Incoming AC power wiring should be done by a qualified and licensed electrician, using the appropriate size wires for the installation. Consider the motor size and type of starter, and also the length of wire required from the main power distribution center in determining the proper wire size.

Proper branch circuit protection and disconnect device(s) must be provided, as required by applicable local, state and national codes.

2.3.2 Grounding

WARNING: Proper grounding is vital for the safe operation of your system. Bring the ground wire to the ground stud that is labeled "GND" or "G1". You must choose the proper conductor size and minimize the resistance to ground by using shortest possible routing. See national electrical code article 250-95, or the related local applicable code.

Proper grounding is vital for the safe operation of your system, and will also reduce the likelihood of noise-induced problems, which could include CPU crashes, or I/O communication errors.

- The grounding wire should be sized per the applicable codes.
- Connect the ground to a good building ground, such as the structural steel of the building, or a cold water pipe.
- Connect the ground on the controller to the stud labeled "GND" or the terminal "G1", as shown on the controller schematic.

2.3.3 Motor Wiring

Connect the motor as shown on the schematic. Consult the applicable codes for proper wire sizing and circuit protection for the motor being used.

3. Start-Up Instructions

Traction systems should not be run in temporary mode, but should use the PLC to provide all required signals for running the car. Otherwise proceed through each of these steps and checks before applying power.

3.1 Before Applying Power

The system has been programmed and tested for the specific elevator system, so no further changes should be made without consulting with Virginia Controls.

3.1.1 Power and Grounding

WARNING: Confirm that the voltage of the incoming power matches the controller before applying power to the controller.

Check the system for improper grounds before applying power to the controller.

With the power off, remove the fuses from the secondary of the main control circuit transformer ("CCXF"). Check the safety circuit (terminals 1 through 6, and 14, 16, 18, 19) for grounds. Using a Volt-Ohm meter connect one lead to terminal 35 (ground) and touch the other lead to each terminal to be tested. The resistance should be considerably greater than 100 ohms.

NOTE: If the fuses are not removed, the meter will read a short through the windings of the main control circuit transformer.

With the fuses still removed, apply power to the controller, and verify that the voltage at the secondary of the main control circuit transformer ("CCXF") is 110-125VAC.

3.1.2 Input/Output Wiring

NOTE: The input/output boards are equipped with quick disconnect terminal blocks. During the initial installation, you may want to remove the terminal blocks, hook up your field wires to the terminal blocks, test the field wiring for no shorts to ground or hot (terminal 1) before plugging these terminals back into the I/O boards.

With the power off, and the fuses removed, check each input point for grounds, as described in the previous section, "Power and Grounding". If a ground is observed, check the schematic to determine if this is correct (it usually is NOT!).

With the power off check each output for grounds, also check for shorts to the hot side (terminal 1). Note that some field devices, such as buzzers, will have very low resistance.

WARNING: Each output point should be isolated from ground and the hot side.

3.2 Applying Power

Remove all fuses before applying power. Reinsert the fuses, one circuit at a time, checking each circuit before adding the next. Check for the proper voltage at the top of each fuse holder before installing the fuses for that circuit.

It is recommended that you start up the controller in Inspection mode, which can be done by opening the Inspection Switch, or removing the field wire(s) from terminal 23.

When power is turned on to the programmable controller the Power, OK and RUN lights on the Power Supply should come on. The program memory is prom (Programmable Read Only Memory), so does not require the battery to maintain it.

WARNING: The field wire in terminal 23 is HOT. If it is removed, make sure it is insulated and labeled. Reconnect it when the car is to be taken off Inspection Operation.

3.2.1 Motor Rotation

On traction systems with an MG set, check for the proper rotation of the MG Drive motor and the Hoistmotor. Also note the polarity of the loop connections as shown on the schematic. Confirm that the polarity of the tachometer signal, if used, is correct.

If a Reverse Phase relay is provided, check that the OK light is on when power is applied to it. If the OK light is not on, then reverse any on the two wires connected to the A, B & C terminals.

3.2.2 Motor Timing

“TRUP” - Run Timer. (used with Wye-Delta starters only) It is energized preset time after the motor starts to run and changes the connection of the motor from “Wye” to “Delta”. The recommended setting is 5.0 seconds for MG sets (see the starter sheet).

4. Final Adjustments

When the controller is ready to be run in automatic, it is recommended that a factory reset be performed. This can be done by (1) Turning off the power; (2) Put the car on inspection; (3) Jump terminals 1 to 21 and 1 to 22; (4) Turn on the power until the "Run" light on the Power Supply has come on; (5) Turn off the power, and remove the jumpers, and continue as normal.

As the wiring is completed, the following modes of operation can be checked and used.

4.1 Inspection Operation

To run the car on Inspection Operation, the safety string (including the door contacts, terminal landing normal slowdowns, normals and finals) should be operational.

The Doors Closed relay (DC) should be energized, and the corresponding input on the I/O board should be on.

The Inspection Input (normally Input A3) should be de-energized.

Pressing the Up Run and Run Buttons will energize the 1st Landing Car Call Button Input, which will cause the Up Direction and Door Close outputs to come on.

When the Doors Closed input comes on, the up run outputs will energize, and the car will run up.

(Down direction is similar)

4.2 Floor Position and Slowdown

The program is in PROM (Programmable Read Only Memory). The floor relays and fire service relays are maintained in the Microprocessor RAM memory and are held through power loss by the battery in the Power Supply. The floor relays may need to be reset when the controller is initially installed. This will be accomplished when the elevator hits any floor switch. With a pulsing type selector, the floor position is reset at either terminal landing when a slowdown switch and a leveling switch are energized at the same time.

NOTE: If floor switches are used, they should be maintained at the terminal landings, so that they are energized whenever the car is in the slowdown zone at that landing.

Make your final adjustments for the slowdown targets. All slowdown distances should be equal.

If a pulsing selector arrangement is used, remember to install the reset targets at the terminal landings.

4.3 Position Indicators

Verify that the floor position changes properly as the car goes past each landing. Floor change should take place at the slowdown point before each landing.

If the Position Indicator does not match the actual car position, run the car to a terminal landing reset target (with pulsing selector only).

4.4 Independent Service

Independent Service is useful for final tune-up of the car. Initiate Independent Service by turning on the Independent Service Switch in the car, or by jumping the Independent Service Switch input.

On Independent Service, the hall calls will be ignored. The car will run from car calls only, and will park with the doors open. To close the doors, jump terminal 1 to terminal 28 ("Door Close Button" input). This jumper may be left on, if desired, so that the car may be run by jumping the desired car call input.

NOTE: To run the car from the machine room, without the doors opening, remove the wire from the Door Open Limit Switch Input (which is usually wired to terminal 7X).

NOTE: If the car does not run, verify that no door protective device (Door Open Button, Safety Edge, Electric Eye, Infrared Curtain) is holding the doors open. Verify that the car is not stuck in leveling. Verify that the Door Close Button input is energized.

4.5 Car and Hall Calls

To observe the operation of the car and hall calls, the system must be in automatic operation. Verify that all car and hall calls work.

NOTE: On DUPLEX systems the doors must be allowed to operate for the calls to be canceled properly.

Each call will be canceled when the car initiates slowdown for the call, or when the doors start to re-open for the call if the car is already at the floor.

If both hall calls are entered at an intermediate landing, and no other calls are in the system, the doors will close after answering one of the calls, then re-open in response to the other call.

4.6 Door Operation

Verify that any required changes to the door operator, as shown on the door operator drawings, have been made correctly.

Check the Door Open and Close Limits for proper operation.

If the doors attempt to open for too long, the open cycle will be stopped. The car will then respond to other calls, and try to open the doors again.

If the doors fail to close properly within a preset time, the doors will re-open, and try to close again. If the doors closed, but the car does not run in response to a call, the doors will re-cycle, and the car will try again.

For very slow doors, the Door Stuck Timer, which initiates the Door Open and Door Close Fail, as described above, may need to be increased. It is normally set at 15 seconds.

If Nudging Operation is activated, the Electric Eye will be disabled when the Nudging Timer has tripped AND the doors are fully open. If the nudging timer trips while the doors are closing, the Nudging Buzzer will turn on, and the Electric Eye will remain active. If the doors do reopen fully, then the Electric Eye will be cut out. The Safety Edge Input remains active on nudging.

4.7 Fire Service

Fire Service Phase 1 may be initiated by turning off a Smoke Sensor input, or by energizing the Hall Fire Switch "On" input.

Confirm that the car returns to the correct Main and Alternate landings.

Confirm that the car operates as required on Car Fire Service (Phase 2) operation.

NOTE: To reset Hall Fire Service (Phase 1), most codes require the Bypass input be energized. To disable Hall Fire Service, jump the Hall Bypass input on. On 2000 (or later) Fire Code, Fire Service (Phase 1) is reset when the Hall Fire Switch is turned from Bypass to Off.

NOTE: If Car Fire Service (Phase 2) appears to be operating incorrectly, check the Door Open and Close Limits for proper operation. Most codes require that the doors be fully open before allowing a change in the mode of operation on Car Fire Service. Most codes require that Hall Fire Service (Phase 1) be in effect for the car to return automatically to the main fire landing when the Car Fire Switch is turned to the off position.

4.8 Zoned Duplex

The Duplex System will keep one car at the Main Dispatch Landing, as the Lobby Car, and allow the other car, or the Free Car, to stop at its last call. The Lobby Car will answer calls in the Lobby Zone, and the Free Car will answer all other calls. The Lobby Car may leave the lobby to assist the Free Car under various load conditions as described below under Start Control. The "Lobby Zone" is an adjustable group of landings but the factory preset value is normally the Lobby/Main landing and any landings below the Lobby/Main landing. All other landings are in the "Upper Zone". If a car is "Next" in a zone, then it will answer calls in that zone, otherwise it will answer calls in the other zone. If both cars are in service, a car will always be homed to the Main Lobby level.

4.8.1 Common Circuits

Several circuits need to be energized when either car is on. These include the Hall Calls, Fire Service, and some other circuits that may be required for a particular job (such as Emergency Power, Hospital Service, etc.). These circuits get their power from either car by means of the VR (Voltage) relay (see the schematic).

4.8.2 Next Car

A "Next Car" is selected for the Lobby Zone and the Upper Zone. This car will be assigned hall calls in the respective zone. The other car may answer calls in a zone where it is not "Next", but it will not normally be sent to calls outside its zone. The "Next Car" assignments can be seen in the communication signals (see below).

4.8.3 Car Start

The Car START feature controls when the car will respond to registered Hall Calls by controlling the internal direction circuits. When the START circuit is energized the car will immediately begin to

respond to Hall Calls. There is a separate start circuit for the Lobby Zone and the Upper Zone. A car will always respond to Car Calls immediately.

The START circuit is energized if ANY of the following conditions are true:

1. The car is Next in that zone.
2. The car is in the other zone, and is NOT next in that zone. (This means that both cars are in the other zone, so the car that is not next in the other zone will be pulled into this zone.)
3. The call(s) in this zone have been registered for a preset time. (This allows the other car to help in heavy traffic situations.)
4. The car is not in normal group operation (Communication Output Point 5 will be off).
5. The other car is not in normal group operation (Communication Input Point 5 will be off).
6. The other car has a call behind it, (Communication Input Point 5 will be flashing).
7. Emergency Power is activated, and this car is assigned to run.

4.8.4 Homing

If there are no cars at the Main Dispatch landing, the "Next" car in the Lobby Zone will home, or return, to the Main Dispatch Landing. If there is no "Next Car" in the Lobby Zone, then the first available car will home to the Lobby. If desired, the "Free" car can be set up to home to a specific (adjustable) landing in the upper zone, or to home to the Main landing. (See the separate description on Feature Adjustments.)

A car will home if the following conditions have been met for 2 seconds:

1. The car is in group operation (not on Inspection, Independent Service, Fire Service, Load Weighing etc.).
2. The Stop Sw is not thrown.
3. The car is not stuck.
4. The doors are closed.
5. The car is not at the Main Dispatch Landing.
6. The car is not running.
7. The other car is in group operation.
8. The other car is not next in the Lobby Zone.
9. The other car is not running down.
10. The other car is not homing.

4.8.5 Communication

Communication between each car is achieved through the Input and Output Modules. That is, the Communication Outputs on Elevator A are connected to the Communication Inputs on Elevator B, and similarly the Communication Outputs from Elevator B are connected to the Communication Inputs on Elevator A. A Multiplexing system is used to allow the communication of more than just the 8 Input/Output points. This operates as follows:

The Output Point 1 turns on and off regularly to sequence the data transfer. The program now can transmit two pieces of data on each output point, one piece when Point 1 is ON and one piece when Point 1 is OFF. The Microprocessor receiving data will monitor Point 1, and check the status of each other Communication Point just after Point 1 goes ON and also just after Point 1 goes off. If Point 1 is not going on and off, then the program assumes the other Microprocessor is out of service.

Communication Data

If Point 1 is ON...

And Point 2 is ON, the car is CANCELING UP HALL CALLS.

And Point 3 is ON, the car is NEXT in the UPPER ZONE.

And Point 4 is ON, the car is NEXT in the LOBBY ZONE.

And Point 5 is ON, the car has NO CALLS BEHIND IT (Back Calls).

And Point 6 is ON, the car is at Landing 1 (Binary).

And Point 7 is ON, the car is at Landing 4 (Binary).

And Point 8 is ON, the car is running on Emergency Power.

If Point 1 is OFF...

And Point 2 is ON, the car is CANCELING DOWN HALL CALLS.

And Point 3 is ON, the car is on FIRE SERVICE PHASE 2.

And Point 4 is ON, the car is HOMING, RUNNING DOWN, at the MAIN LDG, or NEXT in the Lobby Zone.

And Point 5 is ON, the car is IN SERVICE.

And Point 6 is ON, the car is at Landing 2 (Binary)

And Point 7 is ON, the car is at Landing 8 (Binary)

And Point 8 is ON, the car wants to run on Emergency Power.

NOTE: The Car Position, Points 6-7, is in Binary code. (Point 8 is used with more than 15 landings.) To determine the car position, add the landing values together. For example, if the car communication lights for Binary 1 and Binary 2 are both on, then the car is at the 3rd landing.

NOTE: If the Data light (Points 2-8) is flashing in sequence with Point 1, then the Data from the FIRST GROUP is true. If the Data light (Points 2-8) is flashing out of sequence from Point 1, then the Data from the SECOND GROUP is true. If the Data light (Points 2-8) is on all the time, then the Data from the first and second groups is true.

NOTE: This description applies to the operation of the Inputs and the Outputs. The Outputs will show the status of the Microprocessor for that Elevator, and the Inputs will show the status for the other Elevator.

Example Of Communication Data

Initial Conditions: There are no car calls registered. Both cars are at rest.

Elev A is at the Main (2nd) Landing, Elev B is at the 4th landing.

Elev A Communication Outputs	Elev B Communication Outputs:
#1 = flashing	#1 = flashing
#2 = off	#2 = off
#3 = off	#3 = flashing with #1
#4 = on	#4 = off
#5 = on	#5 = on
#6 = flashing opposite from #1	#6 = off
#7 = off	#7 = flashing with #1
#8 = off	#8 = off

A "1U" Hall Call is registered.

Elev A will answer this call, since it is the Lobby Zone Next car.

Communication Output changes:

Elev B: There should be no changes, since this car is not to move.

Elev A: #6 will flash with #1 when the car changes to the 1st floor.

#2 will flash with #1 when the car answers the call at the 1st landing.

Note: While Elev A is responding to the call, the following should NOT occur.

(If any of these conditions occur, then Elev B will start toward the call)

#2 should only start flashing 1 second after the car gets to the 1st floor.

#3 should not come on at all.

#4 should remain ON at all times.

#5 should remain ON at all times.

#6, #7, #8 are not critical.

To test the Hall Call Help-Out timer, put Elev B out of service while it is in the Upper Zone, but jump Elev B Communication Output Point #5 ON. Elev A will think that Elev B is still in service. Now register a hall call in the Upper Zone, and see how long Elev A takes to leave the Main Landing to respond to the call. The factory time is 30 seconds.

4.9 Failure Timers

4.9.1 Stuck Button Timer

If a car or hall call button remains on for an adjustable time, and other calls are registered, the stuck button call will be ignored, and the car will answer the other call(s). The car will return to the stuck button call as it answers other calls, and the stuck button timer sequence will be repeated.

4.9.2 Running Timers

Traction systems - If the car runs for an adjustable time, without changing floors, then running shutdown operation will be initiated. The shutdown could be caused by a problem with the motor starter circuit(s); or a problem with the drive system; or a problem with the selector. The car will drop the fast speed outputs, then stop. It will then be shut down, with only the Door Open Button and door protective devices being operational. The fault can be reset by cycling the Main Line Disconnect Switch, or by putting the car on "Inspection" then back to "Automatic".

NOTE: If a Reverse Phase Relay or Emergency Power circuitry is supplied, these will also initiate a shutdown signal if the inputs are not energized.

A sequence fault timer monitors key inputs from the drive system, such as Drive Enabled, Brake Micro Switch, and contacts of the key drive contactors. If these fail to change state properly as the car starts or stops, then the car will be shut down. The fault can be reset by cycling the Main Line Disconnect Switch, or by putting the car on "Inspection" then back to "Automatic".

A leveling timer is provided that will cut out leveling if the car has been leveling for over 15 seconds. This prevents the car from stalling in leveling. The car will not be shut down, but will not be allowed to relevel until the car has run to another floor.

4.9.3 Door Fault Timers

If the doors fail to open fully after an adjustable time, the open cycle will be canceled. The door time will expire as normal, the doors will close, and the car will continue to answer calls.

If the doors fail to close after an adjustable time, the doors will reopen, and attempt to close again. The doors will be held open an adjustable time (factory set at 15 seconds) which allows the door motor to remain cool. The close cycle will be repeated until the doors close.

4.9.4 Door Check Circuitry

Door Check circuitry is an optional feature that is provided as required by the appropriate codes. A Door Contact fault condition is recognized if ALL the following conditions exist:

1. The "DC" or "DG" relay Input is energized (the car or hall doors are closed), AND
2. The Door Close Limit Input is energized (the car door is not fully closed), AND
3. The Up Level and Down Level Inputs are both off (the car is not leveling).
4. The doors are not opening or closing.

If the above fault condition exists then the fault will be initiated after 0.1 seconds. When a Door Fault is initiated, the Door Fault Output will energize and the doors will be held open. The fault is cleared when the door contacts relay input(s) go off.

When the doors are fully open, and the car is not leveling, the DOLX output will energize. This will change the connections of the car door and hall doors, so that the PLC can monitor the car and hall doors independently.

4.10 Field Adjustable Features

Refer to the section on changing Settings and Features to see the features that are adjustable.

The controller is already set up for the specific job when it is shipped from Virginia Controls. It is recommended that the "Factory Reset" sequence be performed when the controller is first powered up. This can be done by (1) Turning off the power; (2) Put the car on inspection; (3) Jump terminals 1 to 21 and 1 to 22; (4) Turn on the power until the “Run” light on the Power Supply has come on; (5) Turn off the power, and remove the jumpers, and continue as normal.

4.11 Typical Traction Adjustments

1. EST - EMERGENCY STOP SWITCH TIMED RELAY. (HIGH SPEED TRACTION ELEVATORS) Energized when the Emergency Stop Switch in the car is in the "On" or "Run" position. It is a time delay drop out relay, and allows the car to slow down if the Stop Switch is thrown while the car is running. "ES" will de-energize the speed relays or speed circuits, causing the car to start to slow down, but "EST" will hold the direction relays, allowing the car to slowdown normally, before applying the brake. This provides a smoother stop, with less strain on the equipment than an immediate stop would. The time on "EST" should be adjusted by means of the multi-position switch "EST", which changes the amount of capacitance in parallel with the relay coil.
2. UDT and UDTX - CAR RUNNING TIMED RELAYS. (Some TRACTION ELEVATORS) Energized when the car is running, and held for a short time after the car stops. On M.G. set systems, it allows the Electric Stop to hold the car before the Brake sets, and the suicide circuit closes. On SCR Drive systems, it allows the Drive to hold the car at zero speed while the brake sets.
3. RUXP or TRUP - M.G. SET RUN TIMER. (Used with M.G. sets only.) Energized preset time after the M.G. set starts to run. It will change the connection of the motor from "Y" to "Delta". Recommended setting is 4.8 seconds, no adjustment is necessary.
4. GENERATOR SERIES FIELD SHUNT WIRE. (Used with some M.G. sets only.) Adjust to give proper compounding. The Shunt Wire is a coil of 10-14 gauge wire, approximately 6 feet long, located in the Generator junction box (shorten or lengthen wire to change compounding). The Shunt Wire is at the same temperature as the generator, thus compensating for any resistance change due to temperature change of the generator.

Refer to the Schematic for specific information on the specific drive system used with each installation. Refer also to the manufacturer's instructions for the regulator or drive system used.

4.12 ETSD Monitoring System Setup

The ETSD board by Virginia Controls is a hardware system for traction elevator controllers, which provides a level of redundancy for a specific set of control functions required by the A17.1 Safety Code for Elevators and Escalators. See Chapter 5 for additional details.

Figure 1 - ETSD Monitoring System

4.12.1 Setup of the UCM (Unintended Car Movement) System

1. With power off, verify that UCM Select Jumper is set to “RB” for use with a Rope Brake device, or set to “EB” for use with a machine Emergency Brake.

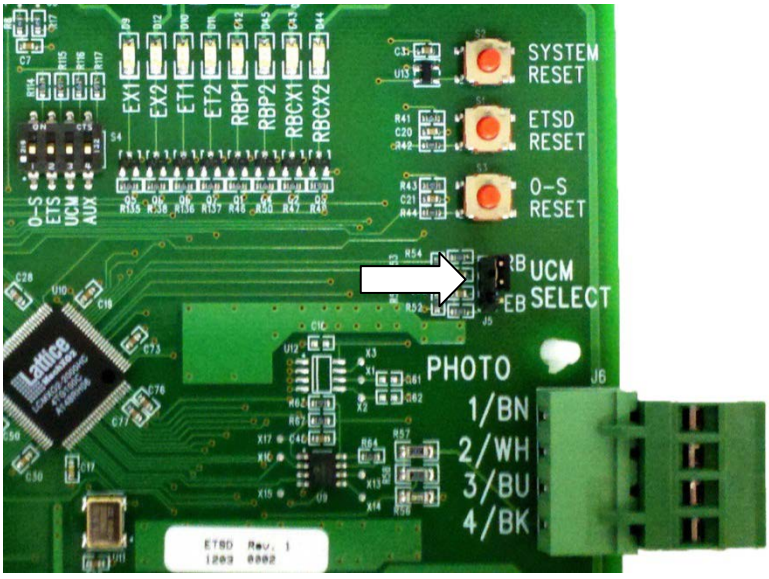


Figure 2 - UCM SELECT Jumper

NOTE: If a label has been applied by VCI for setting this jumper, then follow it.

2. To begin construction, defeat the UCM System (and O-S and ETSD Systems) by placing a jumper from controller TB-1 to Inputs SHTDFT and ETSDFT.
3. Power up the controller and verify that Input LED's: "EII, ETSDFT and SHTDFT" are lit.

Figure 3 - ETSDFT & SHTDFT Indicators

4. Other Input LED's may be lit as well, but also verify that Relay Output LED's: "EX1, EX2, ET1, ET2, RBP1 and RBP2" are lit to permit movement of the elevator.

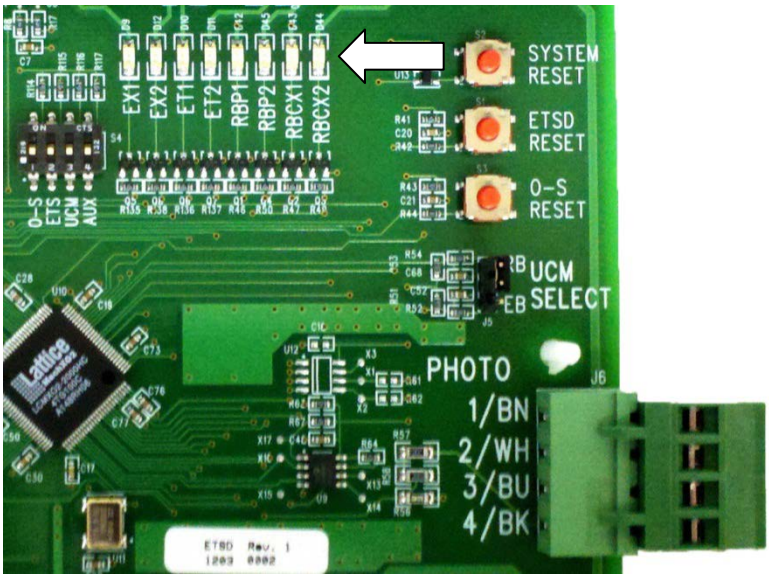


Figure 4 - EX1, EX2, ET1, ET2, RBP1 & RBP2 Indicators

5. Construction of the elevator may now proceed until it is decided that the O-S System should be tuned.
6. Once the O-S System is tuned per the next Setup of the O-S System Section, the jumper from controller TB-1 to Input SHTDFT will be removed.
7. The jumper from controller TB-1 to Input ETSDFT will be removed when the ETSD System is tuned per the final Setup of the ETSD System Section.

4.12.2 Setup of the O-S (Over Speed) System

NOTE: An un-tuned O-S System powers up with both "O-S TRIP & O-S TUNED" LED's off.

The un-tuned O-S System was previously defeated in the Setup of the UCM System section by jumping from controller TB-1 to Input SHTDFT, at power-up.

At any point during construction, when the elevator is running in a controlled and consistent manner, the O-S System can be tuned, therefore, start here!

1. Apply the ETSD Speed Sensor Tape around a machined surface of a sheave (of the machine or on a deflector) that is and will remain free of oil and grease.

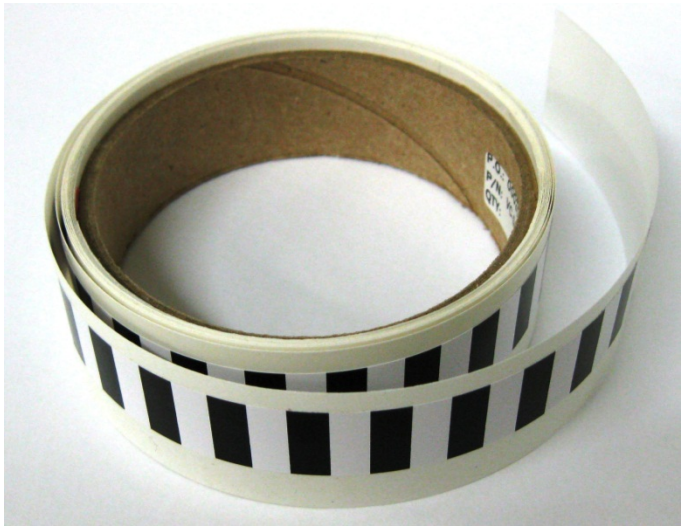


Figure 5 - ETSD Tape

NOTE: The ETSD Tape is ⅝" wide by 10 feet long and should be trimmed to length and can be shaved in width once installed.

2. Insure that the ETSD Tape will not come in contact with the brake pad surfaces of the main or emergency brakes, nor lap over into a rope groove.
3. Mount the Speed Sensor in its steel angle bracket with about half the threaded barrel extending (≈1") through the mounting bracket, and with the controls & LED's of the sensor facing upward for viewing.

Figure 6 - Speed Sensor & Mounting Bracket

4. Use the angle mounting bracket to position the Speed Sensor 6" away from the ETSD Tape at angle that is nearly, but slightly off, perpendicular to the tape.

5. With power off, route the provided 30ft cable and wire per markings on the 4-Pole “PHOTO” connector.

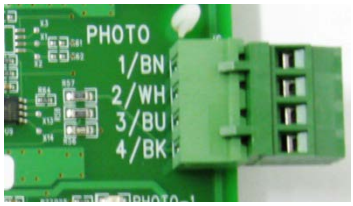


Figure 7 - PHOTO Connector

6. Plug 30ft cable into the Speed Sensor.
7. Apply power to the controller. Verify that the Green “POWER” LED on Speed Sensor lights.

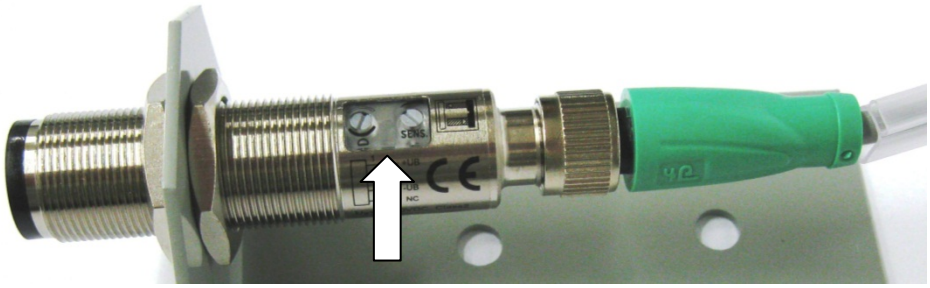


Figure 8 - Sensor POWER LED Indicator

8. Verify that the Yellow “SENSE” LED on the Speed Sensor and the “PHOTO -1” LED of the ETSD Board are lit only when the red light beam of the Speed Sensor is pointed at a white segment of the ETSD Tape.

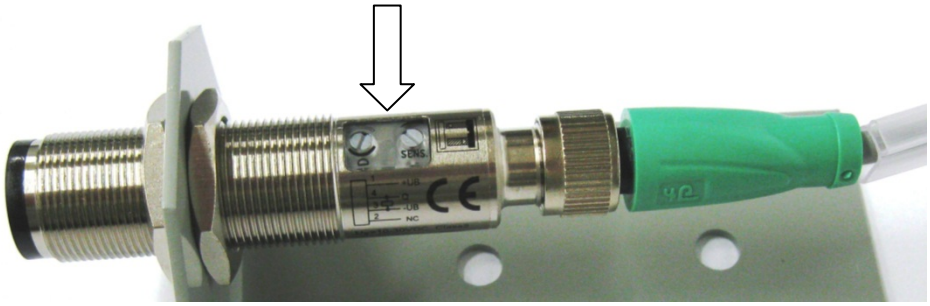


Figure 9 - Sensor SENSE LED Indicator

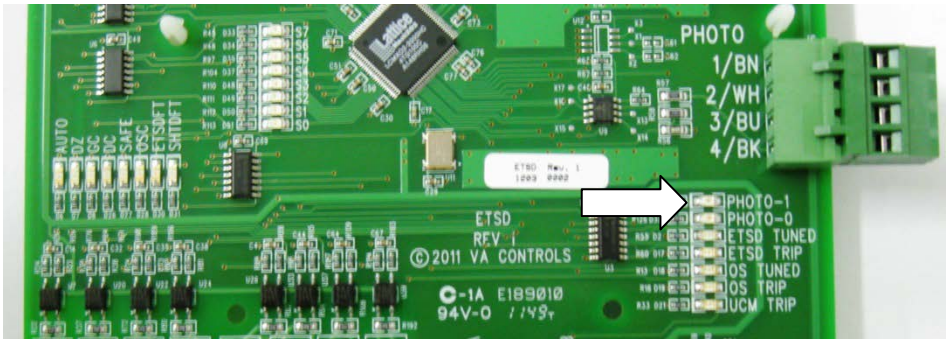


Figure 10 - PHOTO-1 Indicator

9. Verify that the “PHOTO-0” LED on the ETSD Board lights only when the light beam is pointed at a black segment of the ETSD Tape.

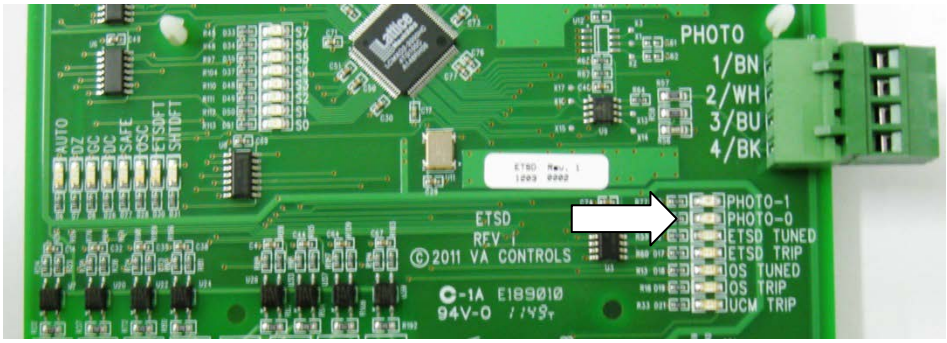


Figure 11 - PHOTO-0 Indicator

10. If the “PHOTO -1” LED on the ETSD Board lights when the sensor is directed at a black segment of the ETSD Tape, check the following:

- “L/D” (Light/Dark) Switch of Speed Sensor is set to “L” or Light.

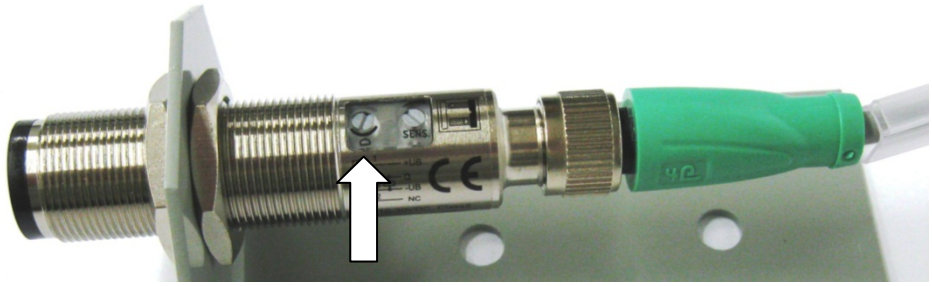


Figure 12 - Sensor L/D Switch

- Speed Sensor is aligned slightly off perfect perpendicular, 5^{o}-10^{o}, from tape.
- “SENS.” Potentiometer of Speed Sensor (2-turn w/clutch) is full clockwise.

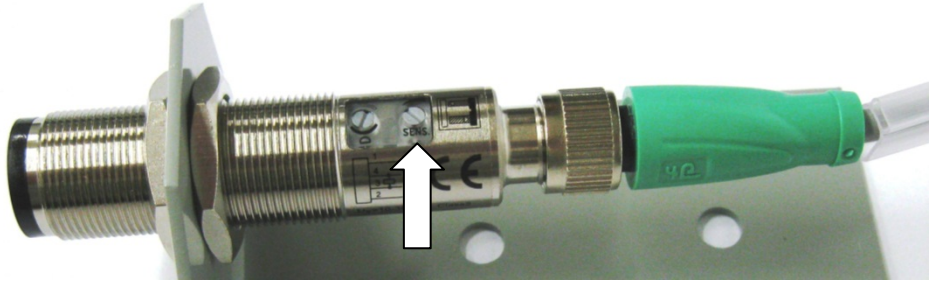


Figure 13 - Sensor SENS Potentiometer

NOTE: The goal of the above steps is a finely focused red light beam on the ETSD Tape with maximum sensitivity to white segments while rejecting black segments.

11. Power down controller and move the jumper from Input SHTDFT to Input OSC.
12. Power up controller and verify that Input LED’s: “EII, OSC & ETSDFT” are lit.

13. Other Input LED's may be lit as well, but also verify that Relay Output LED's: "EX1, EX2, ET1, ET2, RBP1 and RBP2" are lit to permit movement of the elevator.

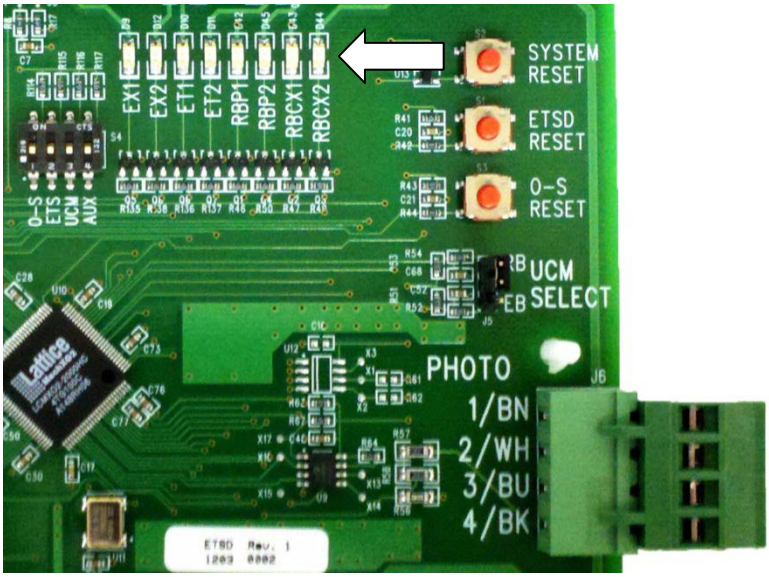


Figure 14 - Output Indicators

14. Set the drive for a speed of 150FPM and run the car on Inspection operation.

> **NOTE: Car speed should be checked with hand tachometer, or repeat later when available.**

15. When elevator comes to a stop, remove jumper at Input OSC with power on. The "O-S TUNED" LED will light indicating a valid calibration of O-S System.

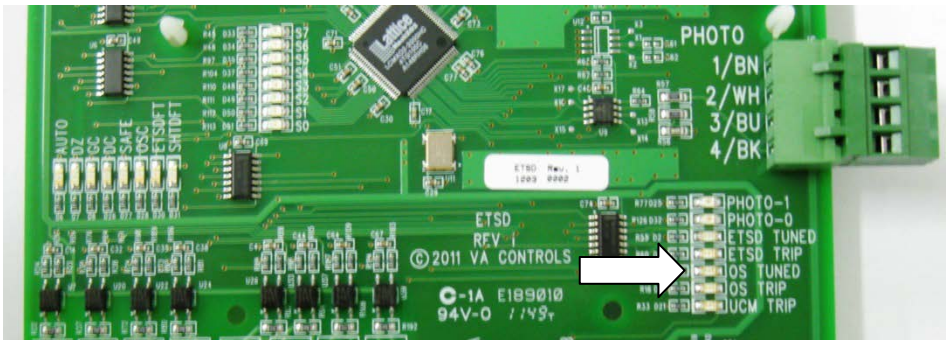


Figure 15 - O-S TUNED Indicator

16. Return the drive to its former Inspection Speed setting (40-50FPM).
17. Power down to complete the removal of Input OSC jumper from controller TB-1.
18. Power up controller and verify Input LED's: "EII & ETSDFT" are lit, and that Relay Output LED's: "EX1 & EX2" are also lit. Other I/O LED's may be lit as well.
19. The UCM & O-S Systems are now operational.

> **NOTE: The ETSD System alone remains defeated until final adjustments are made on Normal operation.**

4.12.3 Setup of the ETSD (Emergency Terminal Stopping Device) System

Table 1 - Recommended ETS Switch Placement (one N.C. switch per terminal/direction)

Car Speed (FPM)	Switch Placement
225	2'-3"
250	2'-6"
300	3'-6"
350	4'-3"
400	5'-3"
450	6'-6"
500	7'-6"
600	10'-6"
700	13'
800	TBD and only if used with a standard buffer

NOTE: Minimum ETS Switch Cam lengths are 3ft for +200-500FPM, and 6ft for 500-1000FPM to provide approximately 0.33 seconds of dwell time. The ETS Switches may also be maintained to the Final Limit Switch as most cam lengths are +8ft.

An un-tuned ETSD System powers up with both "ETSD TRIP & TUNED" LED's off.

The un-tuned ETSD System was previously defeated in the Setup of the O-S System section by jumping from controller TB-1 to Input ETSDFT.

If the elevator contract speed is 200FPM or less, then the ETSD System is not tuned, and the jumper from controller TB-1 to Input ETSDFT remains in place. Stop here!

If contract speed is greater than 200fpm, proceed with ETSD tuning.

The ETSD System can be tuned only after the O-S System has been tuned.

Once the elevator has been fully adjusted for Normal operation (Contract Speed set along with Accel/Decel & Jerk Rates), and the ETS Switches and Cam are installed per the previous steps, then the ETSD System can be tuned.

1. Power down controller and move the jumper from Input ETSDFT to Input ETSC.
2. Power up controller and verify that Input LED's: "EII, ETSC & AUTO" are lit.

3. Other Input LED's may be lit as well, but also verify that Relay Output LED's: "EX1, EX2, ET1, ET2, RBP1 and RBP2" are lit to permit movement of the elevator.

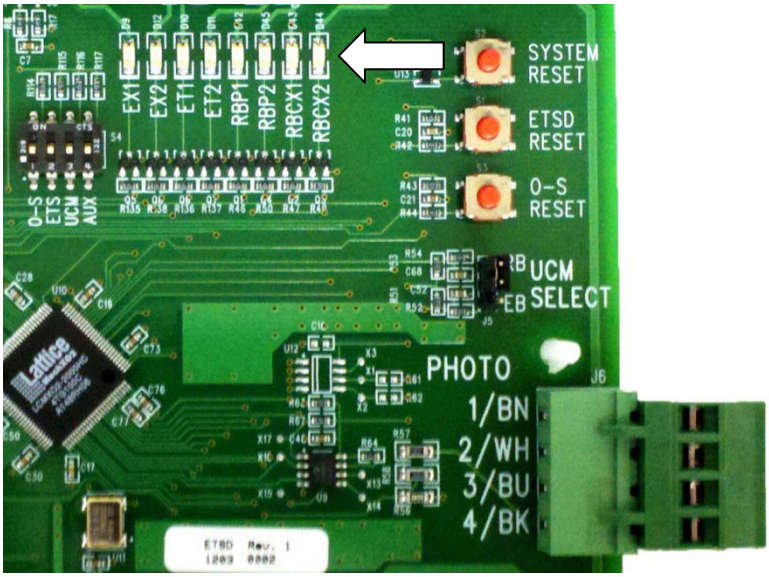


Figure 16 - Output Indicators

4. Set the drive for a speed of 80% of contract speed and send the elevator on a multi-floor run on Normal operation. Verify that the elevator obtains this speed.
5. When elevator comes to a stop, remove jumper at Input ETSC with power on. The "ETSD TUNED" LED will light indicating a valid calibration of ETSD System.

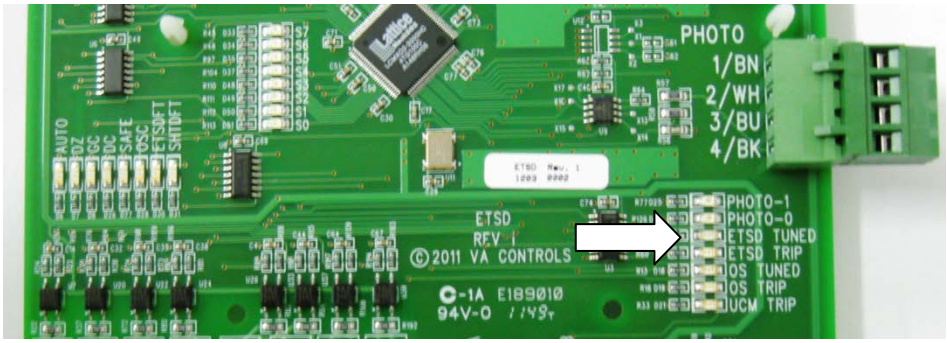


Figure 17 - ETSD TUNED Indicator

6. Return the drive to its former High (Contract) Speed setting.
7. Power down to complete the removal of Input ETSC jumper from controller TB-1.
8. Power up controller and verify Input LED "EII" is lit, and that Relay Output LED's: "EX1 & EX2" are also lit. Other Input & Output LED's may be lit as well.
9. If on Normal Operation and not on an ETS Switch, Relay Output LED's: "ET1 & ET2" should be lit. If lit, remove a wire from Input ETU or Input ETD of the ETSD Board, and verify that Relay Output LED's: "ET1 & ET2" turn off. Replace wire.
10. The UCM, O-S & ETSD Systems are now operational.

5. Hardware Description

The controller consists of the Programmable Logic Controller (PLC) Microprocessor system, Power Supply section, and Relay Interface.

The Microprocessor system consists of the Central Processor Board (CPU), which has the Microprocessor central processing unit (the CPU may be mounted in the backplane, or may be a separate module), the EPROM memory chip (which is located in the CPU), the Power Supply, and the Input/Output boards.

The program is in EPROM (Electrically Programmable Read Only Memory). The floor relays and fire service relays are maintained in the Microprocessor RAM memory and are held through power loss by the battery in the Power Supply. The floor relays may need to be reset when the controller is initially installed.

The Power Supply section includes the required transformers and fuses to power the Microprocessor system and the Relay Interface.

The Relay Interface includes the required relays and contactors to interface the field signals and devices to the Microprocessor. This usually includes a printed circuit board for normal signals, as well as other relays or contactors for signals required for each specific job.

5.1 Microprocessor System

The PLC Microprocessor system contains the hardware that controls the inputs and outputs which control the elevator. This section describes the major components of the Microprocessor system. The system is modular, and each module can be removed from the rack by pressing in the lever on the bottom of the module, then swinging the module up and out of the rack.

WARNING: Modules should only be removed and replaced with power to the PLC turned OFF.

5.1.1 GE Series 90-30

For most low-rise elevator applications with low I/O counts, the CPU is embedded into the backplane allowing all slots available for I/O. The backplanes with the embedded CPU are not expandable.

For higher rise elevator applications, a high-performance CPU (CPU350), which is based on the Intel 386EX processor, is utilized. The CPU is always located in the first slot after the power supply.

Figure 18 - GE Series 90-30 System

5.1.1.1 GE Series 90-30 CPU

The CPU (Central Processing Unit) is built in to the base on 5-slot and 10-slot systems, and is a separate module located on the right of the Power Supply on multi-rack systems. There are no adjustments or connectors directly on the CPU.

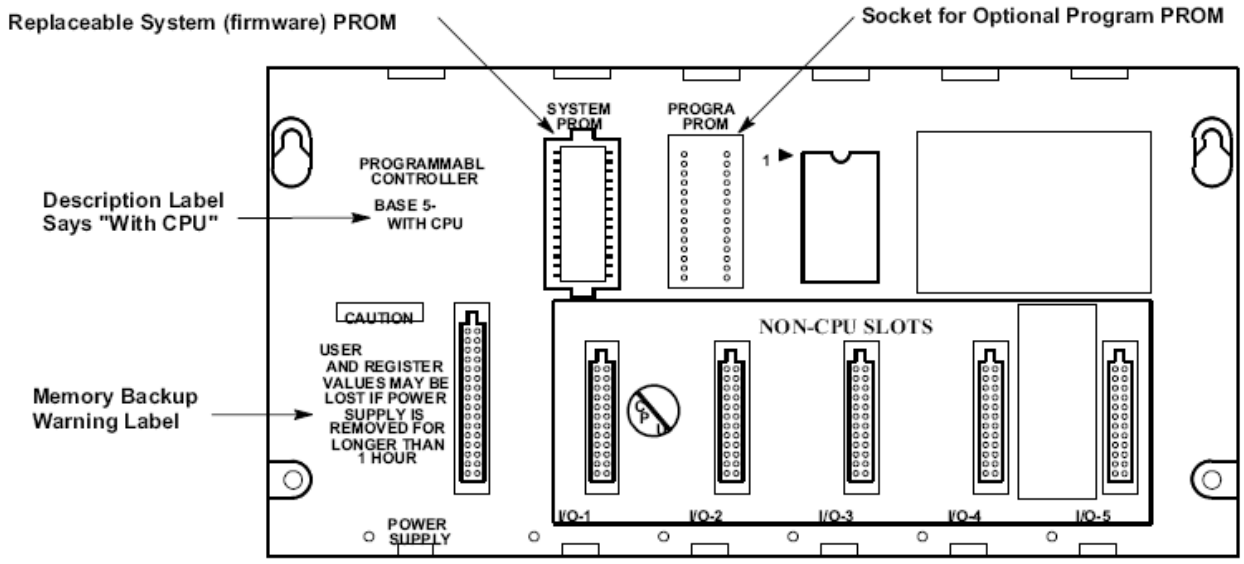


Figure 19 - Models 311 and 313 (5-Slot) Embedded CPU Baseplates

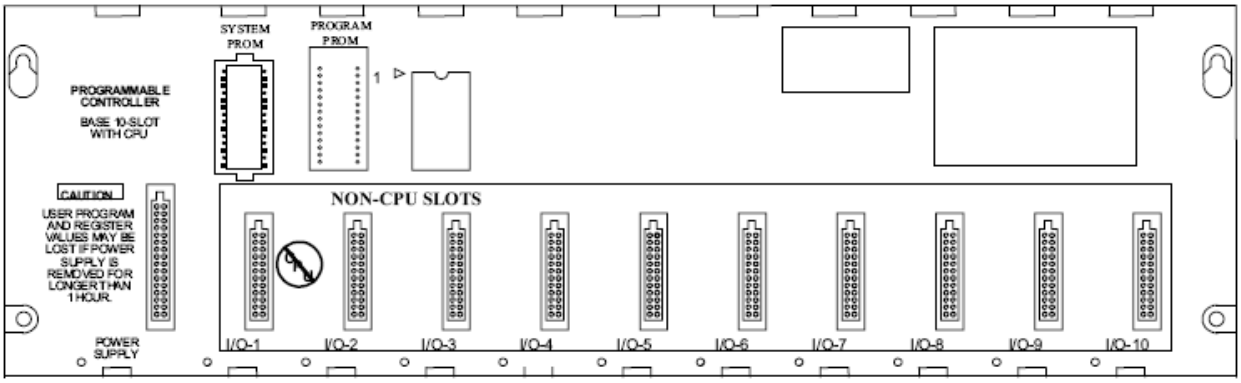


Figure 20 - Model IC693CPU323 (10-slot) Embedded CPU Baseplate

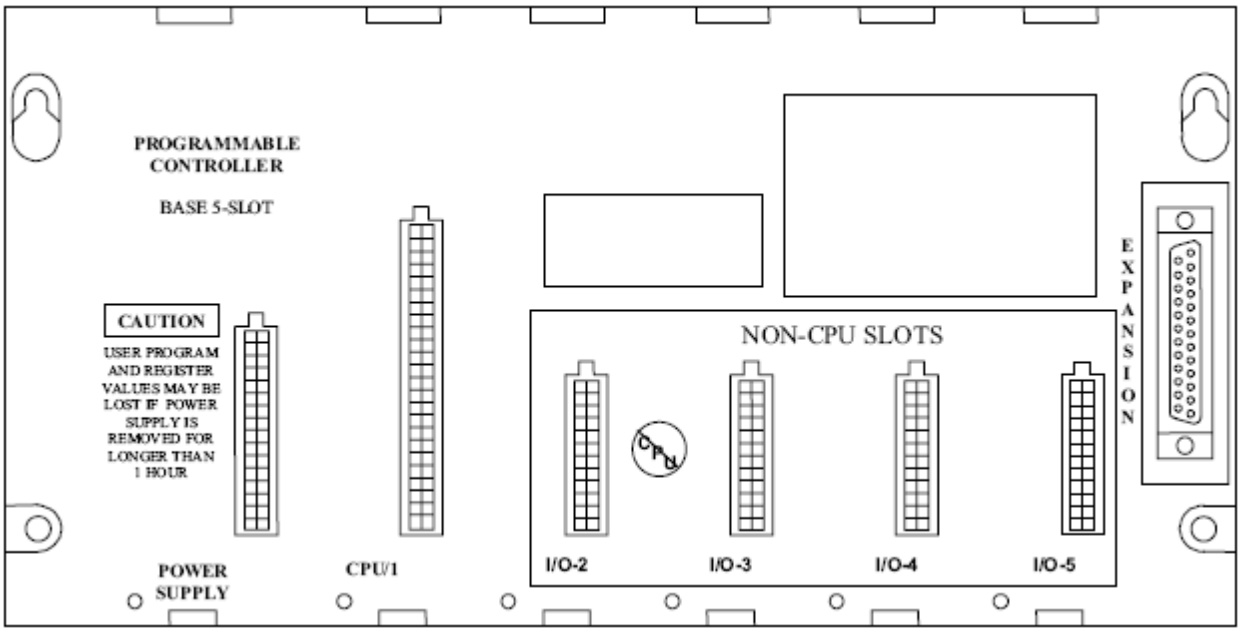


Figure 21 - IC693CHS397 5-Slot Modular CPU Baseplate

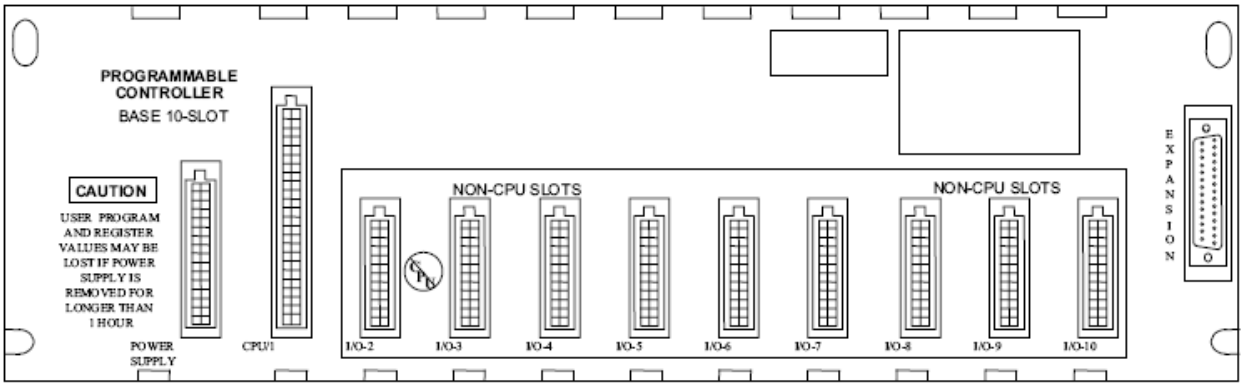


Figure 22 - IC693CHS391 10-Slot Modular CPU Baseplate

5.1.1.2 GE Series 90-30 Power Supply

The Power Supply plugs in to the base on the far left of each rack. It is powered by 115VAC, and provides the necessary voltages to the rest of the PLC system. There is a battery located on the front lower section of the Power Supply that maintains the status of certain registers in the CPU during a power loss. Refer to the maintenance section or the GE manual for instructions on changing the battery.

The Power Supply has a terminal strip on the left for power connections, and a 15-pin connector in the middle for a communications port that can be used with a hand-held programmer or computer for programming or monitoring functions.

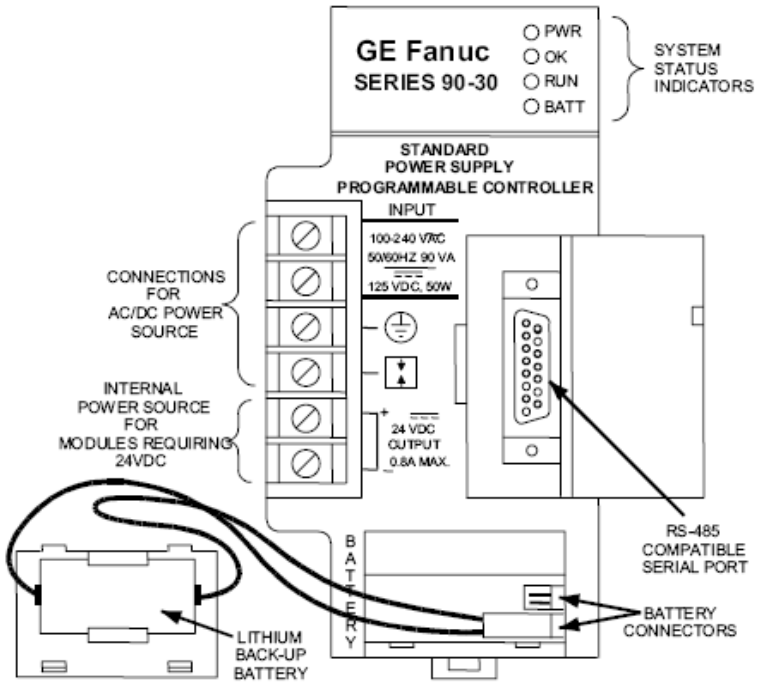


Figure 23 - Standard AC/DC Input Power Supply - IC693PWR321

The Power Supply has a set of LED lights on the upper front section. When power is applied to the Power Supply, the POWER LED will come on immediately. The OK LED should come on after the CPU performs a self-check. If it fails to come on, then check the EPROM to make sure it is inserted properly. The RUN LED should flash then stay on after the CPU finishes the self-check and goes into the run mode. If it fails to come on, there may be a fault with the system. This could be caused by a bad component (Power Supply, CPU, Input or Output Board, or EPROM chip) or by having the Input/Output boards in the wrong slots in the rack.

CAUTION: If the I/O modules are switched so that an Input module is inserted where an Output Module was located (or vice-versa) then the system will not come up in the Run Mode. A hand-held programmer or computer running GE Logicmaster software may be required to get the CPU back in to the Run Mode.

There is a fuse located in the Power Supply, behind the front cover. This fuse will not normally blow, but should be checked if there is power at the terminals of the Power Supply, but none of the LEDs on the front of the Power Supply are on (There may be a slight delay on power up before the LEDs come on. This is normal.)

5.1.1.3 GE Series 90-30 Input and Output Modules

The Input and Output modules are used to connect the PLC with the field devices. The input and output modules are available in a variety of voltages and configurations to meet the needs of the system. The most commonly used modules are 115VAC Inputs and Relay Outputs.

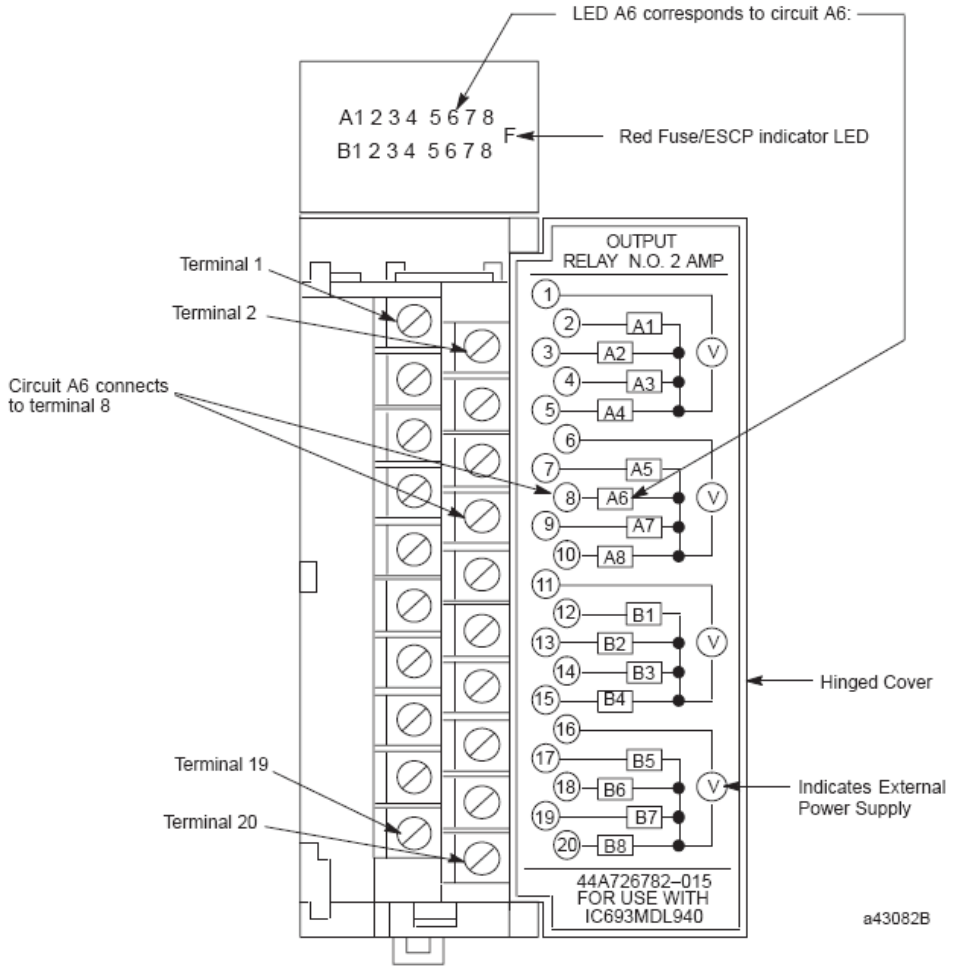


Figure 24 - IC693MDL940 Standard Density Discrete Output Module

Each module has LED indicators to show the status of each Input or Output point. These are located on the front of the module at the top. There are two rows of LEDs, with the top row indicating the status of the first 8 points (Group A) and the lower row indicating the status of the second 8 points (Group B). When a point is on, the LED will light, and will show up as a number between 1 and 8, to indicate which point is on.

NOTE: If trouble shooting assistance is required from Virginia Controls, it is very important to get the status of all Input and Output points to help identify any possible problems.

Connections to the Input and Output modules are made by means of the removable terminal strip on the front lower half of the module. Check the schematic carefully before wiring to the module, as the location of the commons may vary from one type of module to another. The terminal blocks are

removable, so BEFORE power is applied, remove the terminal blocks and check for grounds at the terminal blocks.

CAUTION: Be very careful not to jump to a common when you intended to jump to an input or output, as this could damage the controller or other equipment.

Fuses are provided on the I/O board. The fuses are located on the printed circuit boards inside the modules. The outputs also have external fuses that are rated below the fuses on the modules, so the external fuse will blow first. Check the schematic for the size and name of the fuses for each output module.

The addressing for the boards is handled in the software, and is pre-programmed by Virginia Controls.

CAUTION: Be very careful not to insert an Input Module in a slot allocated for an Output Module, or to insert an Output Module into a slot allocated for an Input Module. If this is done, the CPU will register a fault, and will not come up in the Run Mode. A hand-held programmer or computer running GE LogicMaster software will be required to clear the fault, and get the CPU back in to the Run Mode.

5.1.1.4 GE Series 90-30 Connections

5.1.1.4.1 GE Series 90-30 Incoming Power Terminals

The Incoming Power Connector is a terminal block located on the right front of the Power Supply module. The incoming power is 115VAC.

5.1.1.4.2 GE Series 90-30 Programming Port

The Programming Port is located on the front of the Power Supply. The Hand-held Programmer is plugged in here. Also this port is used to communicate with computers or modems for programming or monitoring applications. The port supports RS422 communications, through a D15 connector.

5.1.1.4.3 GE Series 90-30 Input and Output Terminals

Connections to the Input and Output modules are by means of a removable terminal block mounted on the front of each module. Refer to the schematic for the wiring diagram for each module.

To remove the terminal block, first press the lever at the top of the terminal block behind the swing cover. This will push the top of the block out. Then pull on the small tab at the top of the terminal block to swing the terminal block out and down.

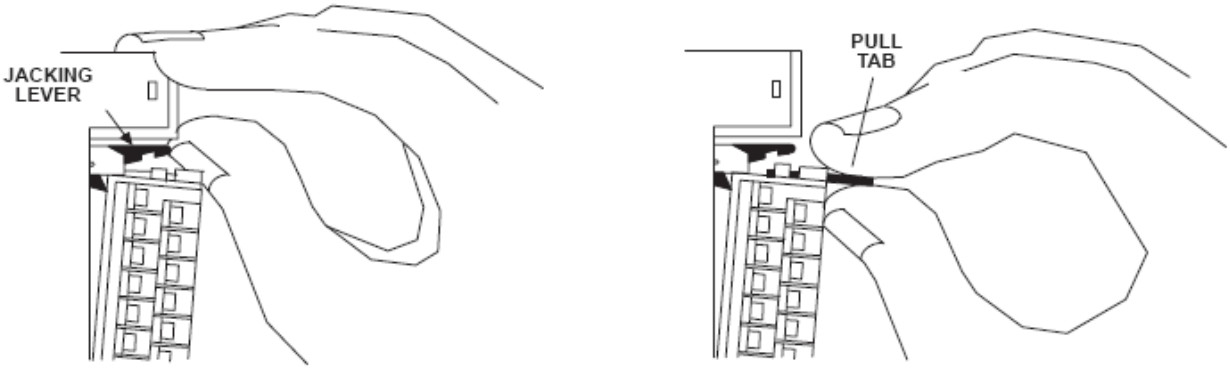


Figure 25 - Removing 20-pin terminal assembly from module

To replace the terminal block, line up the bottom of the block then swing it up and onto the module.

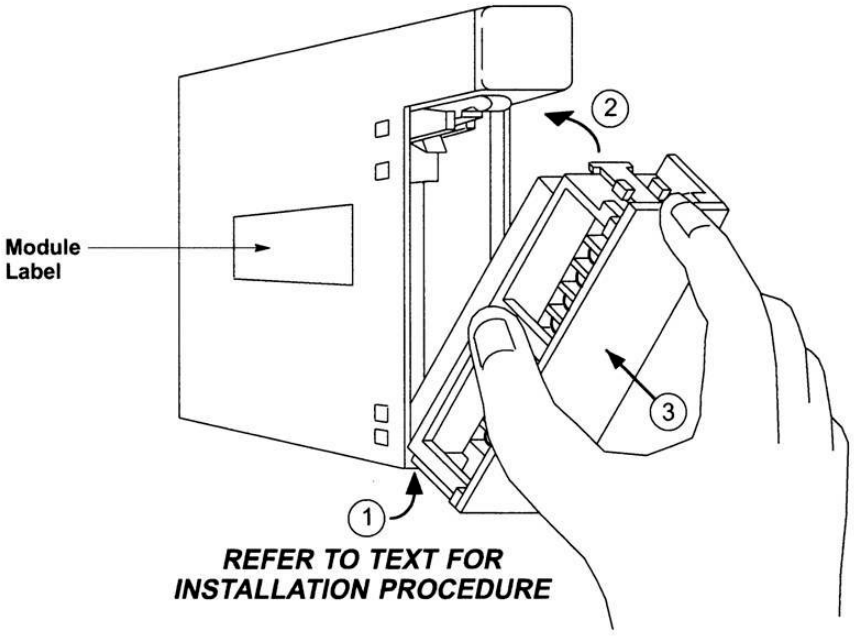


Figure 26 - Installing 20-pin terminal assembly on to module

5.1.1.4.4 GE Series 90-30 Rack Connector

In multi-rack systems, each rack is connected to the rack below using a special cable. This cable is factory installed, and is plugged in to the connector at the far right of the rack.

5.1.2 Allen-Bradley SLC 500 Microprocessor System

Figure 27 – Allen-Bradley SLC 500 System

The Allen-Bradley SLC 500 is a small chassis-based family of programmable controllers, discrete, analog, and specialty I/O, and peripheral devices.

The SLC 500 family delivers power and flexibility with a wide range of communication configurations, features, and memory options.

At minimum, a modular hardware SLC 500 control system consists of a processor module and I/O modules in a single 1746 chassis with a power supply.

A system can be made up of one, two, or three local chassis, for a maximum total of 30 local I/O or communication modules. Multiple local chassis connect together with chassis interconnect cables to extend the backplane signal lines from one chassis to another.

More complex systems can use:

- distributed I/O.
- multiple controllers joined across networks.
- I/O in multiple platforms that are distributed in many locations and connected over multiple I/O links.

5.1.2.1 Allen-Bradley SLC 500 CPU

The **SLC 5/03** processor supplies system throughput times of 1 ms for a typical 1K user program and online editing. The SLC 5/03 processor provides:

Total memory size of 8K or 16K	Control of up to 4096 input and output points
Online programming (includes runtime editing)	Built-in DH-485 channel
Built-in RS-232 channel supporting DF1 Full-duplex, DF1 Half-Duplex Master/Slave for SCADA, DH-485 using a 1761-NET-AIC with a 1747-CP3 cable, and ASCII protocols	Remote I/O passthrough from channel 0 (DF1) or channel 1 (DH485) using a 1747-SN or 1747-BSN remote I/O scanner module
DeviceNet passthrough using 1747-SDN DeviceNet scanner module	Built-in real-time clock/calendar
2 ms Selectable Timed Interrupt (STI)	0.50 ms Discrete Input Interrupt (DII)
Advanced math features - trigonometric, PID, exponential, floating point, and the compute instruction	Indirect addressing
Flash PROM provides firmware upgrades without physically changing EPROMS	Optional flash EPROM memory module available
Key switch - RUN, REMote, PROGram	Battery-backed RAM

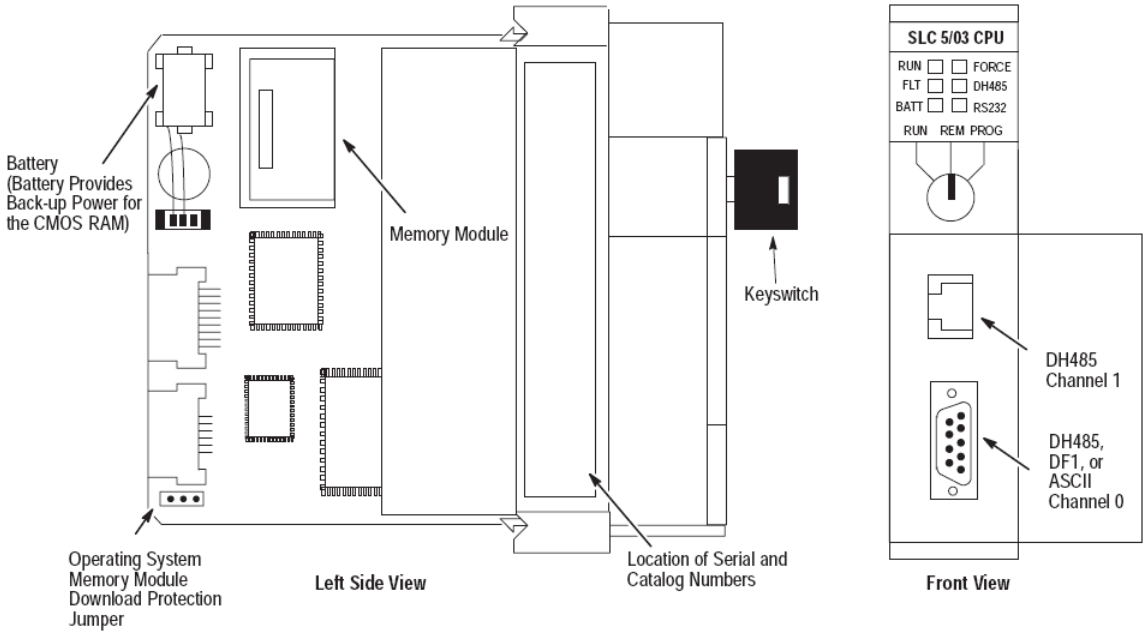


Figure 28 - SLC 5/03 Processors (1747-L531 and 1747-L532)

The **SLC 5/04** processor provides the baseline functionality of the SLC 5/03 processor plus DH+ communication. In addition, the SLC 5/04 processor runs approximately 15% faster than the SLC 5/03 processor. The SLC 5/04 processor provides:

Program memory sizes of 16K, 32K, or 64K	High-speed performance — 0.90 ms/K typical
Control of up to 4096 input and output points	Online programming (includes runtime editing)
Built-in DH+ channel, supporting: High-speed communication (57.6K, 115.2K, and 230.4K baud) and Messaging capabilities	Built-in RS-232 channel supporting DF1 Full-duplex, DF1 Half-Duplex Master/Slave, DH-485 using a 1761-NET-AIC with a 1747-CP3 cable, and ASCII protocols
Channel-to-channel (DH+ to DH-485) passthrough capability	Channel-to-channel (DF1 Full-Duplex to DH+) passthrough
Remote I/O passthrough from channel 0 (DF1) or channel 1 (DH+) using a 1747-SN or1747-BSN remote I/O scanner module	DeviceNet passthrough using 1747-SDN DeviceNet scanner module
Built-in real-time clock/calendar	1 ms Selectable Timed Interrupt (STI)
0.50 ms Discrete Input Interrupt (DII)	Advanced math features — trigonometric, PID, exponential, floating point, & compute instruction
Indirect addressing	Flash PROM
Optional flash EPROM memory module	Key switch — RUN, REMote, PROGram (clear faults)
Battery-backed RAM	

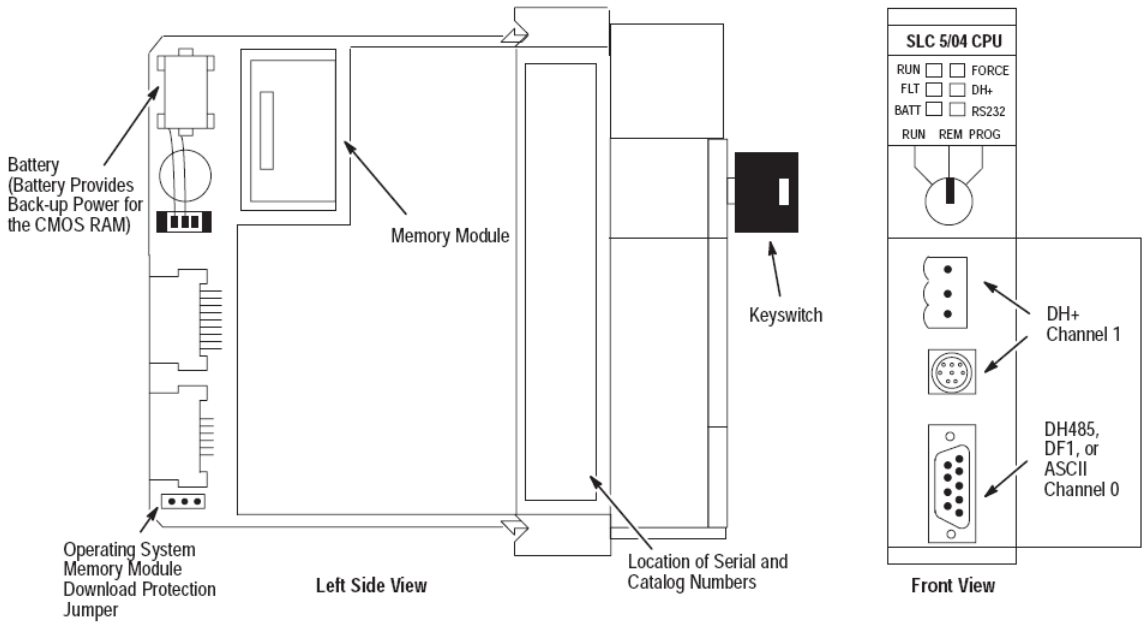


Figure 29 - SLC 5/04 Processors (1747-L541, 1747-L542, or 1747-L543)

The **SLC 5/05** processor provides identical control functionality as the SLC 5/04 processor using standard Ethernet communications instead of DH+. Ethernet communication takes place at 10 Mbps, providing a high-performance network for program upload/download, on-line editing, peer-to-peer messaging, data acquisition, and operator interface (e.g. RSView32). The SLC 5/05 provides:

Program memory sizes of 16K, 32K, or 64K	High-speed performance - 0.90 ms/K typical
Control of up to 4096 input and output points	Online programming (includes runtime editing)
Built-in 10Base-T Ethernet channel, supporting: High-speed communication using TCP/IP, Messaging capabilities, SNMP for standard Ethernet network management and BOOTP for optional dynamic IP address assignment	Built-in RS-232 channel supporting DF1 Full-duplex, DF1 Half-Duplex Master/Slave, DH-485 using a 1761-NET-AIC with a 1747-CP3 cable, and ASCII
Ethernet to DH-485, channel-to-channel passthrough	Ethernet to DF1, channel-to-channel passthrough
Remote I/O passthrough from channel 0 (DF1 or DH485) or channel 1 (Ethernet) using a 1747-SN or 1747-BSN remote I/O scanner module	DeviceNet passthrough using 1747-SDN DeviceNet scanner module
Built-in real-time clock/calendar	1 ms Selectable Timed Interrupt (STI)
0.50 ms Discrete Input Interrupt (DII)	Advanced math features — trigonometric, PID, exponential, floating point, & compute instruction
Indirect addressing	Flash PROM
Optional flash EPROM memory module available	Key switch - RUN, REMote, PROGram (clear faults)
Battery-backed RAM	

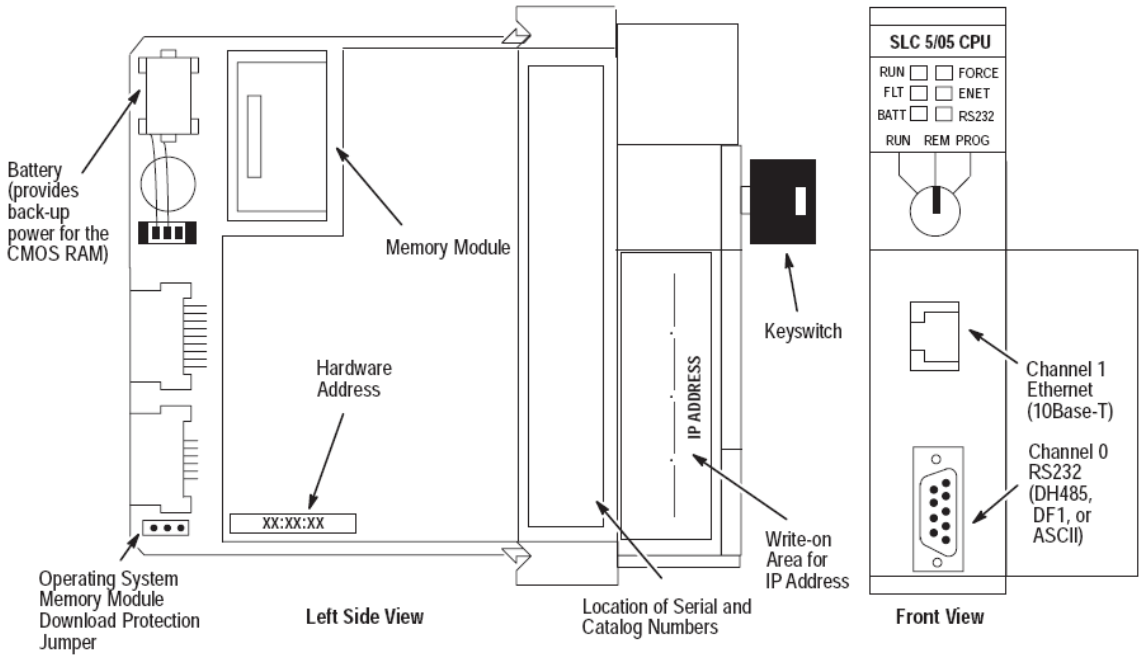


Figure 30 - SLC 5/05 Processors (1747-L551, 1747-L552, and 1747-L553)

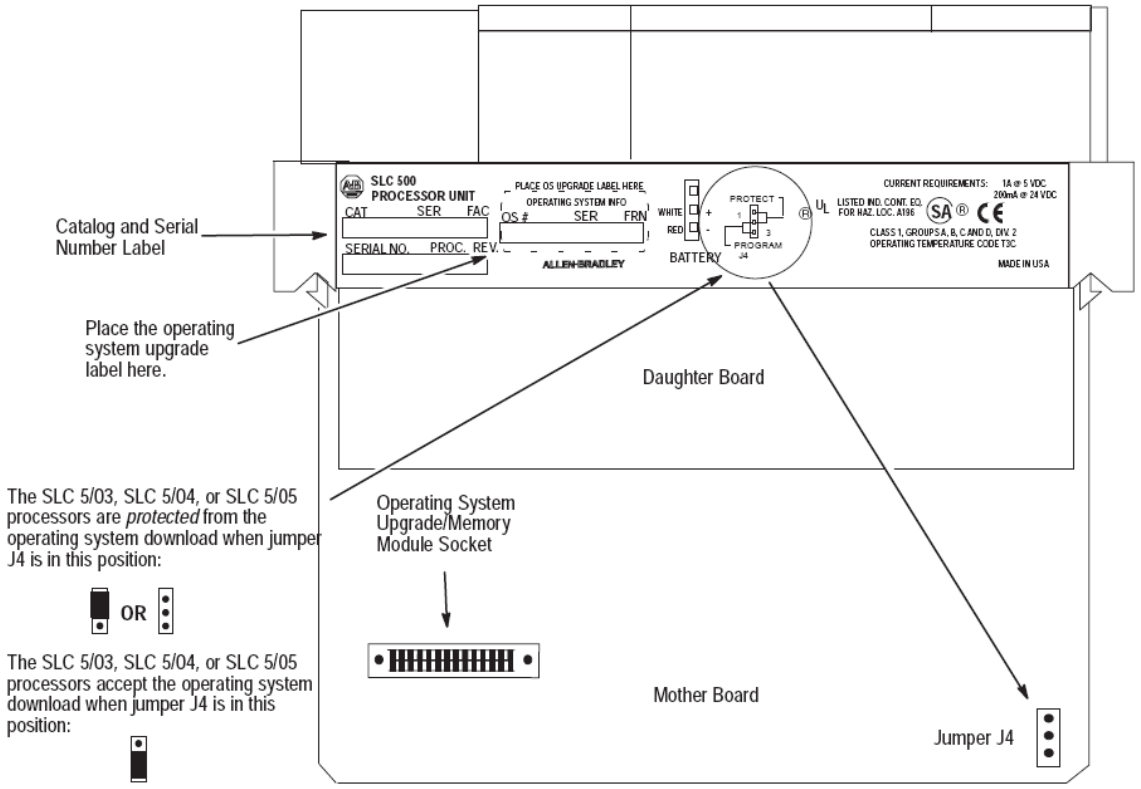

Catalog and Serial Number Label
Place the operating system upgrade label here.
Daughter Board
The SLC 5/03, SLC 5/04, or SLC 5/05 processors are *protected* from the operating system download when jumper J4 is in this position:
OR
The SLC 5/03, SLC 5/04, or SLC 5/05 processors accept the operating system download when jumper J4 is in this position:
Operating System Upgrade/Memory Module Socket
Mother Board
Jumper J4
SLC 500 PROCESSOR UNIT
PLACE OS UPGRADE LABEL HERE
OPERATING SYSTEM INFO
CAT SER FAC
OS # SER FRN
SERIAL NO. PROC. REV.
ALLEN-BRADLEY
WHITE
RED
BATTERY
PROTECT
PROGRAM
J4
CURRENT REQUIREMENTS: 1A @ 5 VDC 200mA @ 24 VDC
LISTED IND. CONT. EQ. FOR HAZ. LOC. A196
CLASS 1, GROUPS A, B, C AND D, DIV. 2
OPERATING TEMPERATURE CODE T3C
MADE IN USA

Figure 31 - SLC 500 Processor Component Locations

5.1.2.1.1 Allen-Bradley SLC 500 CPU Battery

The SLC 5/03, SLC 5/04, or SLC 5/05 processor provides back-up power for RAM through a replaceable lithium battery. This battery provides back-up for approximately 2 years. A BATT LED on the front of the processor alerts you when the battery voltage has fallen below a threshold level.

To replace the lithium battery, follow these steps:

CAUTION: Do not remove the processor from the SLC 500 chassis until all power is removed from the SLC 500 power supply.

1. Remove power from the SLC 500 power supply.
2. Remove the processor from the chassis by pressing the retainer clips at both the top and bottom of the module and slide it out.

CAUTION: Do not expose the processor to surfaces or other areas that may typically hold an electrostatic charge. Electrostatic charges can alter or destroy memory.

3. Unplug the battery connector. Refer to the figure below for battery connector location.

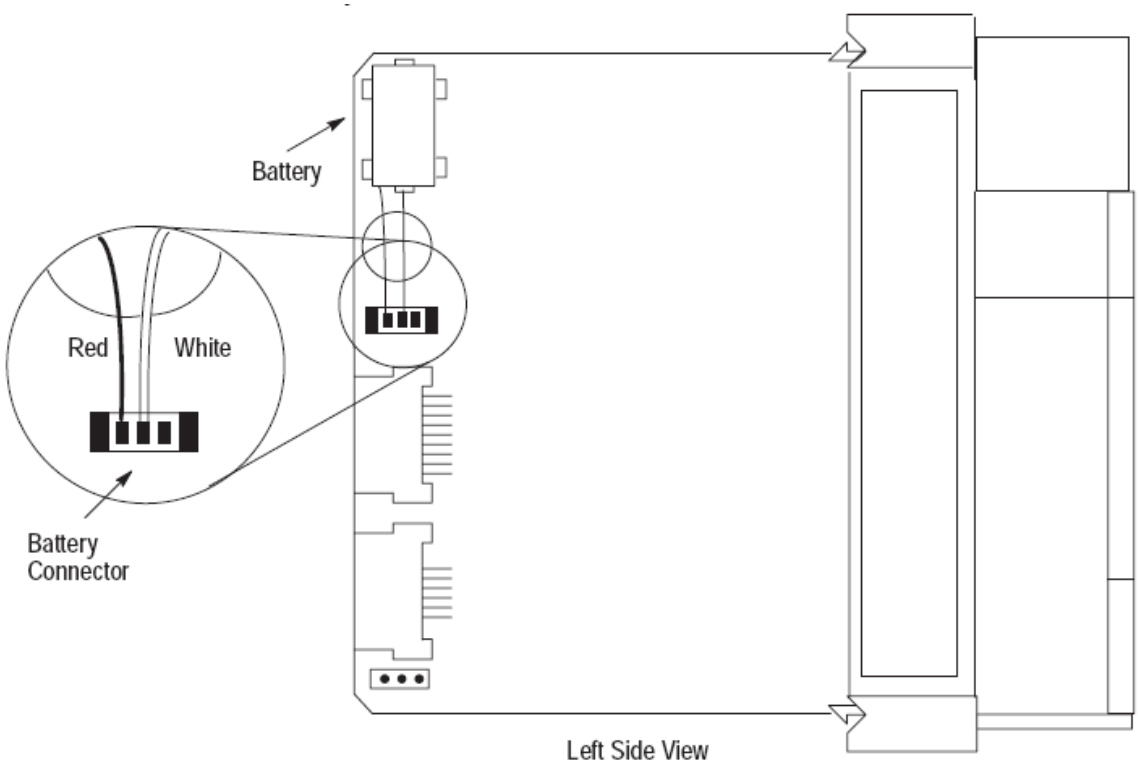


Figure 32 - SLC 500 Processor Battery Location

NOTE: The SLC 5/03, SLC 5/04, and SLC 5/05 processors have a capacitor that provides at least 30 minutes of battery back-up while the battery is disconnected. Data in RAM is not lost if the battery is replaced within 30 minutes.

4. Remove the battery from the retaining clips.
5. Insert a new battery into the battery retaining clips.
6. Plug the battery connector into the socket as shown in the above figure.

7. Re-insert the module into the SLC 500 chassis.
8. Restore power to the SLC 500 power supply.

5.1.2.2 Allen-Bradley SLC 500 Power Supply

The power supply mounts on the left side of each chassis with two screws. For AC power supplies, 120/240 volt selection is made by placing the jumper to match the input voltage. SLC power supplies have an LED that illuminates when the power supply is functioning properly.

CAUTION: Excessive loading of the power supply outputs can cause a power supply shutdown or premature failure.

Power supplies are designed to withstand brief power losses.

NOTE: Power loss does not affect system operation for a period between 20ms and 3s, depending on the load.

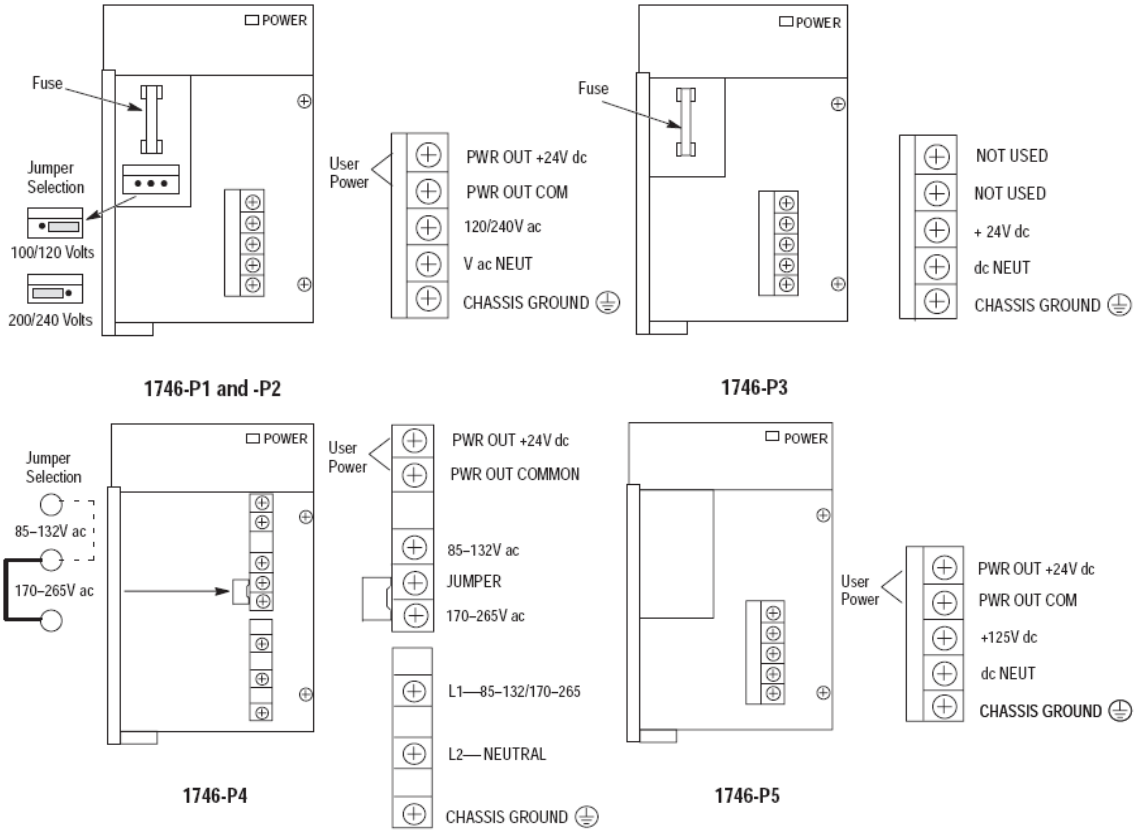


Figure 33 - Allen-Bradley SLC 500 Power Supplies

5.1.2.3 Allen-Bradley SLC 500 Input and Output Modules

The Input and Output modules are used to connect the PLC with the field devices. The input and output modules are available in a variety of voltages and configurations to meet the needs of the system. The most commonly used modules are 115VAC Inputs and Relay Outputs.

Digital I/O modules are available with 4, 8, 16, or 32 channels and in a wide variety of I/O voltages (including AC, DC, and TTL). Combination modules with 2 inputs/2 outputs, 4 inputs/4 outputs, and 6 inputs/6 outputs are also available.

Terminals on the 4, 8, 12, and 16-channel modules have self-lifting pressure plates that accept two 14 AWG (2 mm2) wires. LED indicators on the front of each module display the status of each I/O point.

32-channel I/O modules are equipped with a 40-pin, MIL-C-83503 type header and a removable wiring connector (1746-N3).

Output modules are available with solid-state AC, solid-state DC, and relay contact type outputs. High current solid-state output modules, catalog numbers 1746-OBP16, -OVP16, and -OAP12, have fused commons with a blown fuse LED indication. The 1746-OB16E, -OB6EI, and -OB32E modules provide electronic protection from short circuit and overload conditions.

Each module has LED indicators to show the status of each Input or Output point. These are located on the front of the module at the top. When a point is on, the LED will light and will show up as a number to indicate which point is on.

NOTE: If trouble shooting assistance is required from Virginia Controls, it is very important to get the status of all Input and Output points to help identify any possible problems.

Connections to the Input and Output modules are made by means of the removable terminal strip on the front lower half of the module. Check the schematic carefully before wiring to the module, as the location of the commons may vary from one type of module to another. The terminal blocks are removable, so BEFORE power is applied, remove the terminal blocks and check for grounds at the terminal blocks.

CAUTION: Be very careful not to jump to a common when you intended to jump to an input or output, as this could damage the controller or other equipment.

The addressing for the boards is handled in the software, and is pre-programmed by Virginia Controls.

CAUTION: Be very careful not to insert an Input Module in a slot allocated for an Output Module, or to insert an Output Module into a slot allocated for an Input Module. If this is done, the CPU will register a fault, and will not come up in the Run Mode. A computer running Allen-Bradley RSLogix 500 software will be required to clear the fault, and get the CPU back in to the Run Mode.

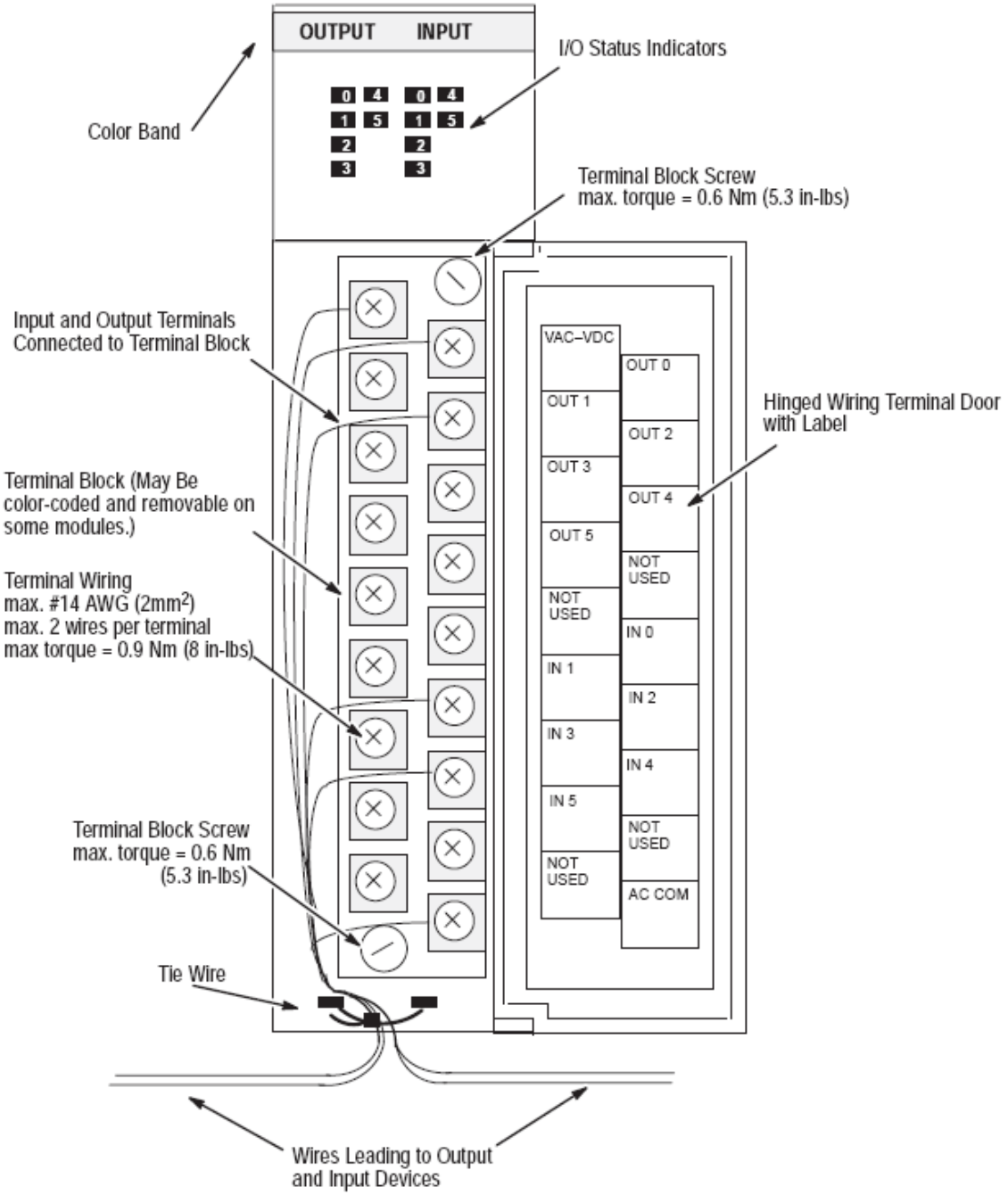


Figure 34 - Features of an Allen-Bradley SLC 500 I/O Module

5.1.2.4 Allen-Bradley SLC 500 Connections

5.1.2.4.1 Allen-Bradley SLC 500 Incoming Power Terminals

The Incoming Power Connector is a terminal block located under the cover of the Power Supply module. The incoming power is 115VAC.

5.1.2.4.2 Allen-Bradley SLC 500 Programming Port

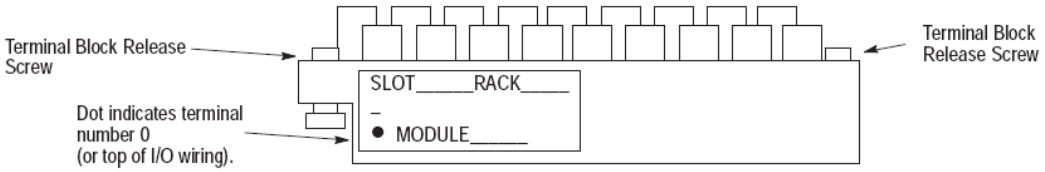
The Programming Port is located on the front of the CPU. This port is used to communicate with computers or modems for programming or monitoring applications.

5.1.2.4.3 Allen-Bradley SLC 500 Input and Output Terminals

Connections to the Input and Output modules are by means of a removable terminal block (some exceptions are possible) mounted on the front of each module. Refer to the schematic for the wiring diagram for each module.

To remove the terminal block:

1. If the I/O module is already installed in the chassis, remove power to the SLC.
2. Unscrew the upper right and lower left terminal block release screws.
3. Grasp the removable terminal block with your thumb and forefinger and pull straight out.
4. Label the removable terminal block with slot, rack (chassis) & module identification.


Terminal Block Release Screw
Terminal Block Release Screw
SLOT_____RACK_____
MODULE_____
Dot indicates terminal number 0 (or top of I/O wiring).

To replace the removable terminal block:

1. Be sure the color of the removable terminal block matches the color band on the module.

CAUTION: Inserting a wired removable terminal block on an incorrect module can damage the module's circuitry when the power is applied.

2. Write the appropriate slot, chassis, and module type on the removable terminal block label.

CAUTION: Disconnect power before attempting to install or remove I/O modules or their terminal blocks.

3. Disconnect power.
4. Align the terminal block release screws with the mating connector in the module.
5. Press the removable terminal block firmly onto the connector contacts.
6. Tighten the terminal block release screws. To avoid cracking the terminal block, alternate the tightening of the screws.

5.1.3 Allen-Bradley MicroLogix 1500 Microprocessor System

Figure 35 - Allen-Bradley MicroLogix 1500 System

The MicroLogix 1500 is a programmable logic control platform that features a two-piece design with a small footprint. The processor and base units slide together to form the complete controller. The processor and base are independently replaceable.

The MicroLogix 1500 uses Compact™ I/O modules to expand the embedded I/O, as well as to provide additional flexibility.

The MicroLogix 1500 system also utilizes Rockwell Software RSLogix™ 500 programming software, and features an instruction set common to the MicroLogix 1000, MicroLogix 1200 and SLC families of controllers.

Program portability of user programs (upload, download and transport) is accomplished via Memory Modules. Real-Time Clock (RTC) modules provide scheduling of control capability.

The optional Data Access Tool (DAT) plug-in device offers the ability to digitally monitor and adjust 48 integer and 48 bit locations for on-the-fly adjustment. Two additional function keys each act as momentary and toggle push buttons.

Security features may be used to protect data from operator changes.

5.1.3.1 Allen-Bradley MicroLogix 1500 CPU

The 1764-LSP processor for the MicroLogix 1500 controller is the base processor in the MicroLogix 1500 family.

The 1764-LSP processor is programmed with RSLogix 500 software and has an instruction set which is compatible with the MicroLogix 1000, and 1200 products, as well as all SLC-500 processors.

It provides large memory size (greater than 7K user program capacity) with 100% retentative data which ensures data integrity even during power loss.

Figure 36 - Allen-Bradley MicroLogix 1500 1764-LSP CPU

The processor offers communications support for a variety of protocols including DF1 Full-Duplex and Half-Duplex Slave, DH-485, Modbus RTU Slave and ASCII. Static data file protection prevents user data from being altered via communication. ASCII read/write capabilities are supported.

The processor provides interfacing to the following advanced features and functionality:

- Optional memory and real-time clock modules
- Optional data access tool (1764-DAT)
- Built-in analog trim potentiometers
- Battery (built-in and replacement)
- 1 ms Selectable Timed Interrupt (STI)
- High-resolution timers
- Latching (pulse-catch) inputs
- Communication toggle push button
- Mode switch for Run/Remote/Program
- Field upgradeable flash operating system

Figure 37 - Allen-Bradley MicroLogix 1500 1764-LRP CPU (shown with optional Data Access Tool)

The 1764-LRP processor for the MicroLogix 1500 controller is a more advanced alternative to the 1764-LSP processor. The 1764-LRP has more memory, data logging capabilities, and a second communication port.

The 1764-LRP processor is programmed with RSLogix 500 software and has an instruction set which is compatible with the MicroLogix 1000, and 1200 products, as well as all SLC-500 processors.

5.1.3.2 Allen-Bradley MicroLogix 1500 Base Units

MicroLogix 1500 base units house embedded inputs, outputs, power supply and the channel 0 port. They also provide the interface to expansion I/O when required by an application. Three base units are available with the following electrical configurations.

- 120/240V ac powered base units
  - 1764-24AWA - (12) 120V ac inputs and (12) relay outputs
  - 1764-24BWA - (12) 24V dc inputs and (12) relay outputs
- 24V dc powered base unit
  - 1764-28BXB - (16) 24V dc inputs and (6) 24V dc FET and (6) relay outputs

The embedded inputs and outputs are used to connect the PLC with the field devices.

Each input and output has an LED indicator to show the status of each Input or Output point. These are located on the front of the base unit. When a point is on, the LED will light and will show up as a number to indicate which point is on.

NOTE: If trouble shooting assistance is required from Virginia Controls, it is very important to get the status of all Input and Output points to help identify any possible problems.

5.1.3.3 Allen-Bradley MicroLogix 1500 Input and Output Expansion Modules

High-density Bulletin 1769 Compact I/O rackless expansion modules complement and extend the capabilities of the MicroLogix 1500 controller by maximizing flexibility of the I/O count and type. Up to eight expansion Compact I/O modules can be connected to a MicroLogix 1500 controller dependent on power requirements.

Figure 38 - Compact I/O Expansion Modules

With MicroLogix 1500 Operating System Revision Number (FRN) 3 or later, you can connect an additional bank of I/O.

In a MicroLogix 1500 system, a maximum of one 1769 Expansion cable can be used, allowing for two banks of I/O modules (one connected directly to the controller and the other connected via the cable). Each I/O bank(1) requires its own power supply (Bank 0 uses the controller's embedded power supply).

Only one power supply (embedded or expansion) may be used on an I/O bank. The expansion power supply cannot be connected directly to a controller that has an embedded

power supply, such as the MicroLogix 1500. It must be connected using one of the expansion cables.

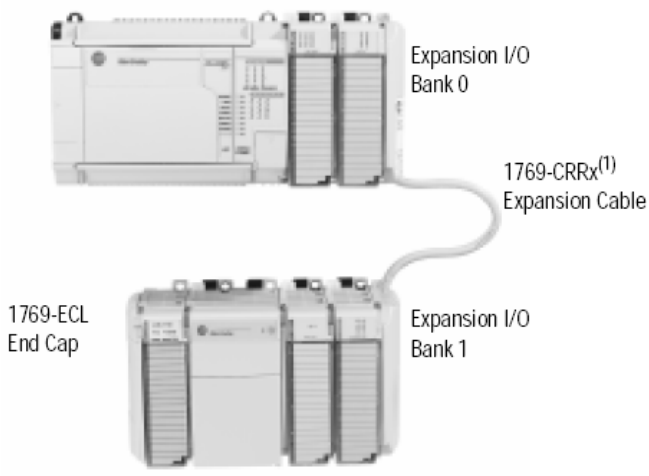


Figure 39 - Allen-Bradley MicroLogix 1500 Expansion (Vertical Orientation)

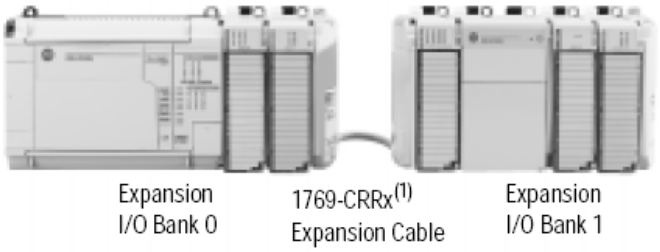


Figure 40 - Allen-Bradley MicroLogix 1500 Expansion (Horizontal Orientation)

5.1.3.4 Allen-Bradley MicroLogix 1500 Data Access Tool

The Data Access Tool provides direct access to 48 bit elements and 48 integer elements. The tool has two function keys and can be used to display controller faults. It can be removed or inserted under power.

Figure 41 - Allen-Bradley MicroLogix 1500 Data Access Tool

5.1.4 Allen-Bradley CompactLogix Microprocessor System

Figure 42 - Allen-Bradley CompactLogix System

Allen-Bradley CompactLogix is a member of the Logix family and provides a single integrated control architecture for sequential, drives, motion, and process control.

The Logix platforms provide a common control engine, programming software environment, and communication support across multiple hardware platforms. All Logix controllers operate with a multitasking, multiprocessing operating system and support the same set of instructions in multiple programming languages.

One RSLogix 5000 programming software package programs all Logix controllers. And, as part of the Integrated Architecture, all Logix controllers offer the benefits of the Common Industrial Protocol (CIP) to communicate via EtherNet/IP, ControlNet, and DeviceNet networks.

5.1.4.1 Allen-Bradley CompactLogix Controllers

Figure 43 - Allen-Bradley CompactLogix Controller

CompactLogix controllers can monitor and control I/O across the 1769 CompactBus, as well as over remote I/O links. CompactLogix controllers can communicate with computers or other processors across RS-232-C (DF1/DH-485 protocol), DeviceNet, ControlNet, and EtherNet/IP networks.

The multi-tasking operating system supports configurable tasks that can be prioritized. One task can be continuous. The others must be periodic or event tasks. Each task can have as many as 32 programs, each with its own local data and logic.

The controller ships without working firmware. The current firmware must be downloaded before using the controller. To load firmware, use:

- ControlFlash utility that ships with RSLogix 5000 programming software.
- AutoFlash that launches through RSLogix 5000 software when you download a project to a controller that does not have the current firmware.
- a 1784-CF64 CompactFlash card with valid memory already loaded.

Cat. No.	Available User Memory (Kbytes)	Nonvolatile Memory	Number of Concurrent Tasks	Communication Ports
1769-L35E	1536 Kbytes	64 Mbytes CompactFlash	8	1 RS-232 port 1 EtherNet/IP port
1769-L35CR	1536 Kbytes	64 Mbytes CompactFlash	8	1 RS-232 port ControlNet channels A and B
1769-L32E	768 Kbytes	64 Mbytes CompactFlash	6	1 RS-232 port 1 EtherNet/IP port
1769-L32C	768 Kbytes	64 Mbytes CompactFlash	6	1 RS-232 port ControlNet channel A
1769-L31	512 Kbytes	64 Mbytes CompactFlash	4	CH0 - RS-232 DF1, DH-485, ASCII fully isolated CH1 - RS-232 DF1, DH-485, ASCII non-isolated

Figure 44 - Allen-Bradley CompactLogix Controllers Specifications

5.1.4.2 Allen-Bradley CompactLogix CompactFlash Card

The 1784-CF64 CompactFlash card provides nonvolatile memory storage for the 1769-L3xx controller. The card stores the contents of the controller memory (program logic and tag values) and the controller firmware at the time that you store the project. Storing information to the CompactFlash card is like storing a snapshot of controller memory at a given time.

This is an optional feature and is not required to operate the controller.

CAUTION: Do not remove the CompactFlash card while the controller is reading from or writing to the card, as indicated by a flashing green CF LED. This could corrupt the data on the card or in the controller, as well as corrupt the latest firmware in the controller.

To install the card, do the following steps:

1. Push the locking tab to the right.
2. Insert the 1784-CF64 Industrial CompactFlash card into the socket on the front of the controller. The label of the CompactFlash card faces towards the left. Match the orientation arrow on the card with the arrow on the front of the controller.

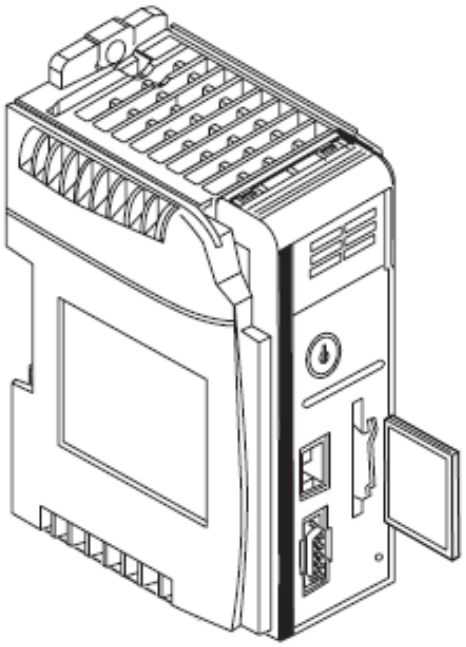


Figure 45 - Allen-Bradley CompactLogix CompactFlash Card Installation

NOTE: The CompactFlash card supports removal and insertion under power.

WARNING: When you insert or remove the CompactFlash Card while power is on, an electrical arc can occur. This could cause an explosion in hazardous location installations.

To remove the CompactFlash card, push the locking tab away from the CompactFlash card and pull the CompactFlash card from the socket.

5.1.4.3 Allen-Bradley CompactLogix Battery

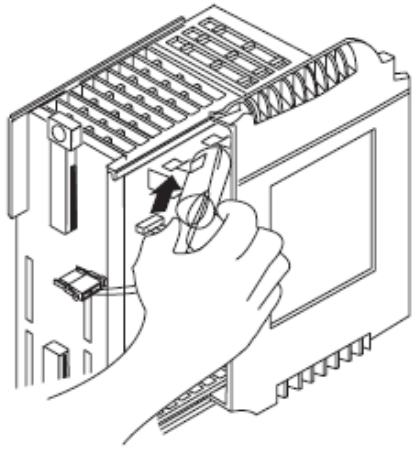
The CompactLogix controller comes with one 1769-BA lithium battery.

CAUTION: The 1769-BA battery is the only battery you can use with the 1769-L31, 1769-L32C, 1769-L32E, 1769-L35CR and 1769-L35E CompactLogix controllers. The 1747-BA battery is not compatible with these CompactLogix controllers and may cause problems.

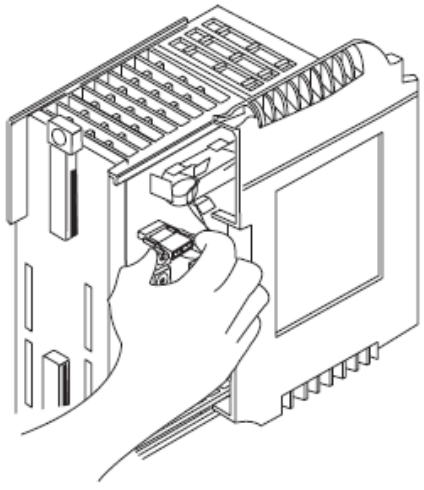
NOTE: Do not remove the plastic insulation covering the battery. The insulation is necessary to protect the battery contacts.

To connect the battery:

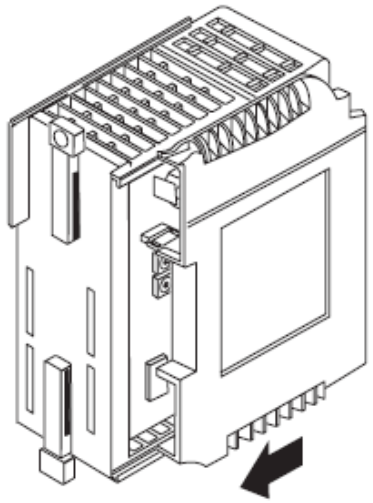
1. Insert the battery into the battery port.



2. Insert the battery connector into the connector port. The connector is keyed to engage with the correct polarity.



3. Slide the side cover back until it clicks into position.



5.1.4.4 Allen-Bradley CompactLogix Power Supply

Compact I/O power supplies distribute power from either side of the power supply. For example, a 2A at 5V dc power supply (1769-PA2, -PB2) can provide 1A to the right side of the power supply and 1A to the left. A 4A at 5V dc power supply (1769-PA4, -PB4) can provide 2A to the right side of the power supply and 2A to the left.

5.1.4.5 Allen-Bradley CompactLogix Input and Output Modules

The Input and Output modules are used to connect the PLC with the field devices. The input and output modules are available in a variety of voltages and configurations to meet the needs of the system. The most commonly used modules are 115VAC Inputs and Relay Outputs.

The 1769 Compact I/O modules can be used as local I/O for a CompactLogix controller. The I/O modules can be installed on a panel with two mounting screws or on a DIN rail. The modules mechanically lock together by means of a tongue-and-grove design and have an integrated communication bus that is connected from module to module by a moveable bus connector.

Each I/O module includes a built-in removable terminal block with finger-safe cover. The terminal block is behind a door at the front of the module. I/O wiring can be routed from beneath the module to the I/O terminals.

Each module has LED indicators to show the status of each Input or Output point. These are located on the front of the module at the top. When a point is on, the LED will light and will show up as a number to indicate which point is on.

NOTE: If trouble shooting assistance is required from Virginia Controls, it is very important to get the status of all Input and Output points to help identify any possible problems.

Connections to the Input and Output modules are made by means of the removable terminal strip on the front lower half of the module. Check the schematic carefully before wiring to the module, as the location of the commons may vary from one type of module to another. The terminal blocks are removable, so BEFORE power is applied, remove the terminal blocks and check for grounds at the terminal blocks.

WARNING: Be very careful not to jump to a common when you intended to jump to an input or output, as this could damage the controller or other equipment.

The addressing for the boards is handled in the software, and is pre-programmed by Virginia Controls.

The modules can be separated into multiple banks. If separated:

- the controller must be in the leftmost position of the first bank
- each bank needs its own power supply
- use expansion cables to connect the banks
- the last I/O bank requires an end cap

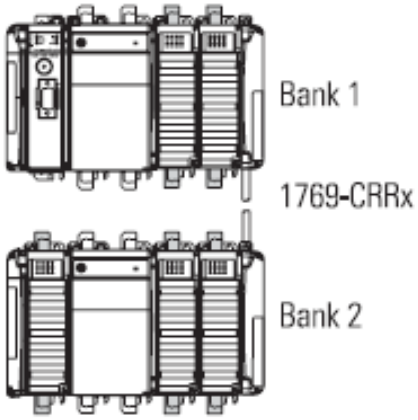


Figure 46 - Allen-Bradley CompactLogix (Vertical Orientation)

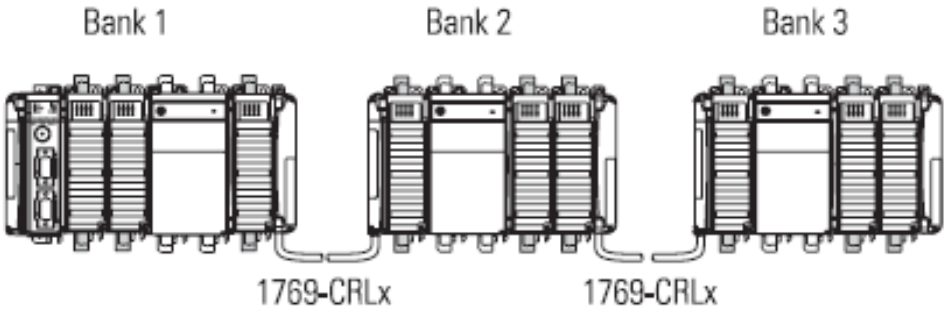


Figure 47 - Allen-Bradley CompactLogix (Horizontal Orientation)

The controller is the leftmost module in the CompactLogix system. The controller has built-in termination, so the leftmost end of the system is terminated. The final I/O bank in the CompactLogix system needs an end cap on the end without the expansion cable.

In addition to local I/O, the CompactLogix controller can control remote (distributed) I/O via:

- EtherNet/IP using a 1769-L32E or 1769-L35E controller
- ControlNet using a 1769-L32C or 1769-L35CR controller
- DeviceNet using a 1769-SDN scanner module

5.1.5 Allen-Bradley ControlLogix Microprocessor System

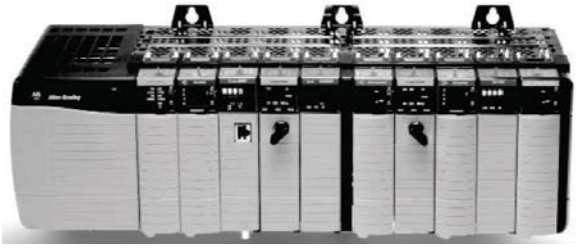


Figure 48 - Allen-Bradley ControlLogix System

Allen-Bradley ControlLogix is a member of the Logix family and provides sequential, process, motion, and drive control together with communications and I/O in a chassis-based system. A simple ControlLogix system consists of a stand-alone controller and I/O modules in a single chassis.

The Logix platforms provide a common control engine, programming software environment, and communication support across multiple hardware platforms. All Logix controllers operate with a multitasking, multiprocessing operating system and support the same set of instructions in multiple programming languages.

One RSLogix 5000 programming software package programs all Logix controllers. And, as part of the Integrated Architecture, all Logix controllers offer the benefits of the Common Industrial Protocol (CIP) to communicate via EtherNet/IP, ControlNet, and DeviceNet networks.

5.1.5.1 Allen-Bradley ControlLogix Controllers

Figure 49 - Allen-Bradley ControlLogix Controller

The ControlLogix controller provides a scalable controller solution that is capable of addressing a large amount of I/O points.

The ControlLogix controller can be placed into any slot of a ControlLogix I/O chassis and multiple controllers can be installed in the same chassis. Multiple controllers in the same chassis communicate with each other over the backplane (just as controllers can communicate over networks) but operate independently.

ControlLogix controllers can monitor and control I/O across the ControlLogix backplane, as well as over I/O links. ControlLogix controllers can communicate with computers or other processors across RS-232-C (DF1/DH-485 protocol), DeviceNet, DH+, ControlNet, and EtherNet/IP networks.

The multitasking operating system supports 32 configurable tasks that can be prioritized. One task can be continuous. The others must be periodic or event tasks. Each task can have as many as 100 programs, each with its own local data and logic.

Cat. No.	Memory Available User Memory✶	I/O Memory❄	CompactFlash:
1756-L61	2 MB	478 KB	Yes
1756-L61S	2 MB Standard 1 MB Safety	478 KB	Yes
1756-L62	4 MB	478 KB	Yes
1756-L62S	4 MB Standard 1 MB Safety	478 KB	Yes
1756-L63	8 MB	478 KB	Yes
1756-L64	16 MB	478 KB	Yes
1756-L65	32 MB	478 KB	Yes
1756-L60M03SE❖	750 KB	478 KB	Yes
1756-LSP	NA - Safety Partner	NA	NA

Figure 50 - Allen-Bradley ControlLogix Controllers Specifications

5.1.5.2 Allen-Bradley ControlLogix CompactFlash Card

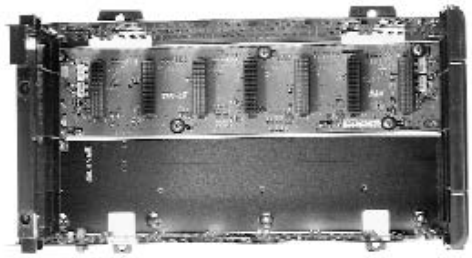
The CompactFlash card offers nonvolatile memory (flash) to permanently store a user program and tag data on a controller.

- 1784-CF64 has 64 MB of memory.
- 1784-CF128 has 128 MB of memory.

The 1756-L6x controllers support a removable CompactFlash card for nonvolatile memory that is installed in a socket on the controller. The CompactFlash card stores the user program, tag data, and controller firmware and can be used to upgrade firmware on 1756-L6x controllers without using RSLogix 5000 software or ControlFlash software.

CAUTION: Do not remove the CompactFlash card while the controller is reading from or writing to the card, as indicated by a flashing green CF LED. This could corrupt the data on the card or in the controller, as well as corrupt the latest firmware in the controller.

5.1.5.3 Allen-Bradley ControlLogix Chassis



The ControlLogix system is a modular system that requires a 1756 I/O chassis. Chassis are available in sizes of 4, 7, 10, 13, and 17 module slots. Any module can be placed into any slot.

The backplane provides a high-speed communication path between modules. Multiple controller modules on the backplane can pass messages between one another.

Figure 51 - Allen-Bradley ControlLogix Chassis

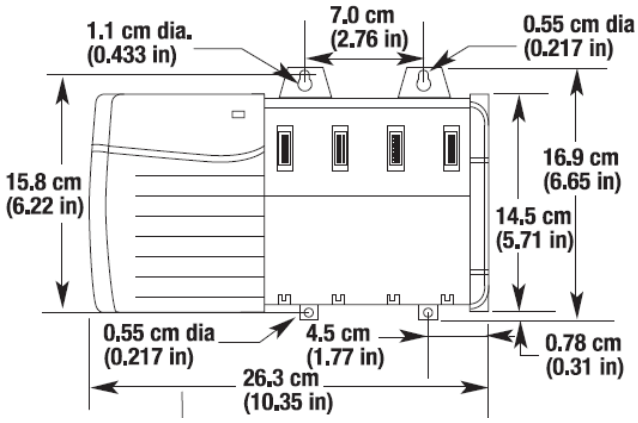


Figure 52 - Allen-Bradley ControlLogix #1756-A4 Chassis (with Power Supply)

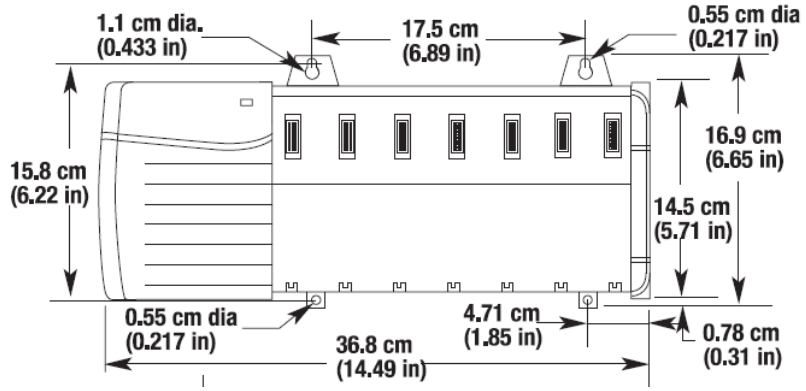


Figure 53 - Allen-Bradley ControlLogix #1756-A7 Chassis (with Power Supply)

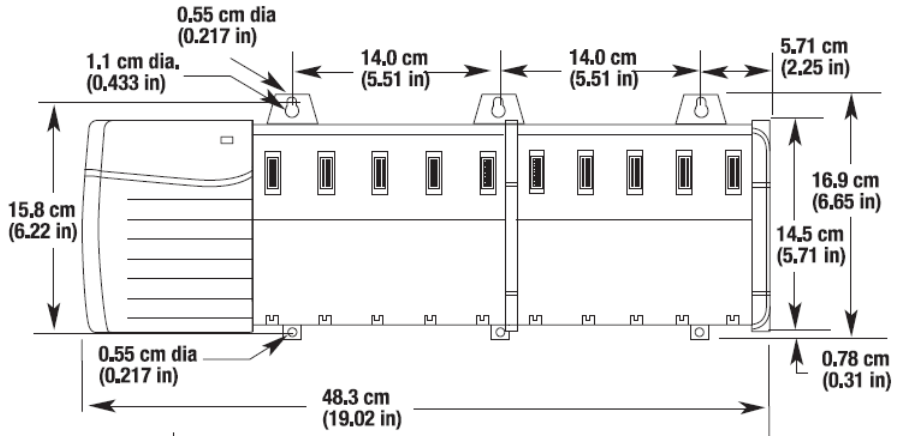


Figure 55 - Allen-Bradley ControlLogix #1756-A10 Chassis (with Power Supply)

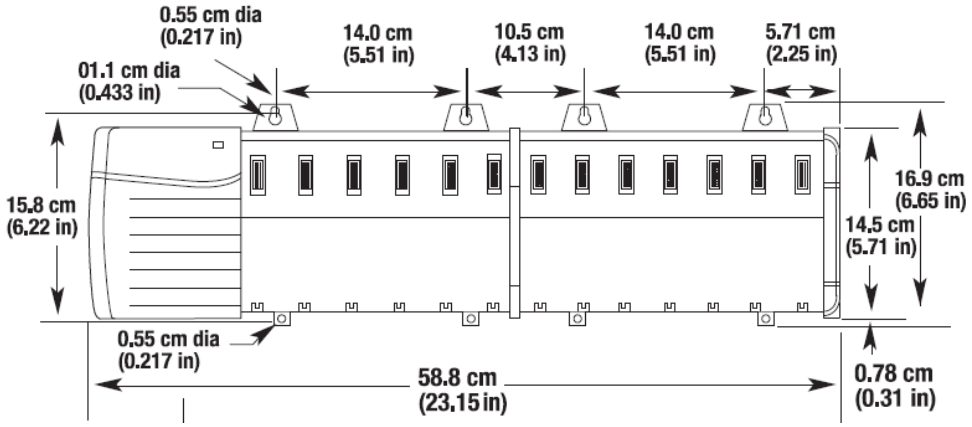


Figure 56 - Allen-Bradley ControlLogix #1756-A13 Chassis (with Power Supply)

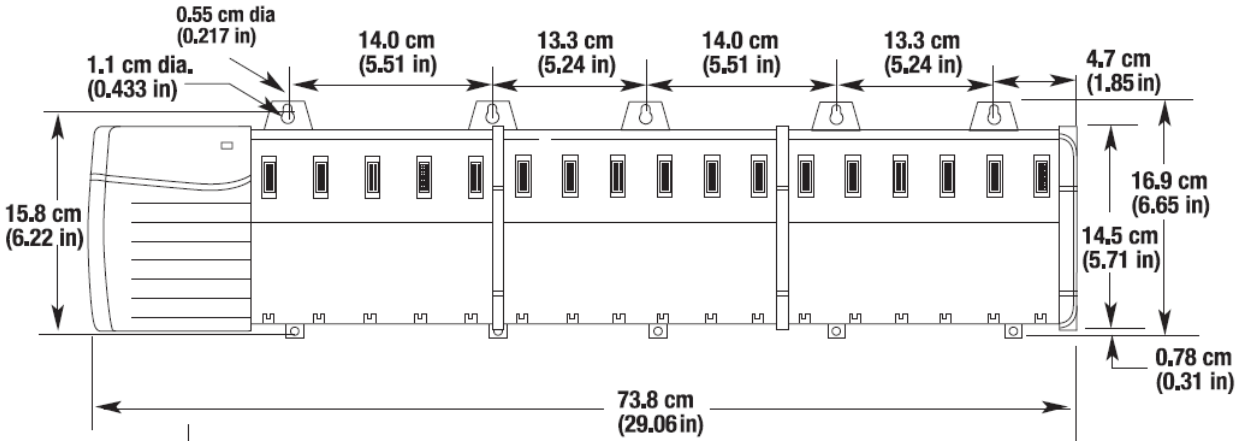


Figure 54 - Allen-Bradley ControlLogix #1756-A17 Chassis (with Power Supply)

5.1.5.4 Allen-Bradley ControlLogix Power Supply

ControlLogix power supplies are used with the 1756 chassis to provide 1.2V, 3.3V, 5V, and 24V dc power directly to the chassis backplane. Standard (1756-PA72, 1756-PB72, 1756-PA75, 1756-PB75, 1756-PC75, 1756-PH75) and redundant (1756-PA75R, 1756-PB75R) power supplies are available.

The standard power supply mounts directly on the left end of the chassis, where it plugs directly into the backplane.

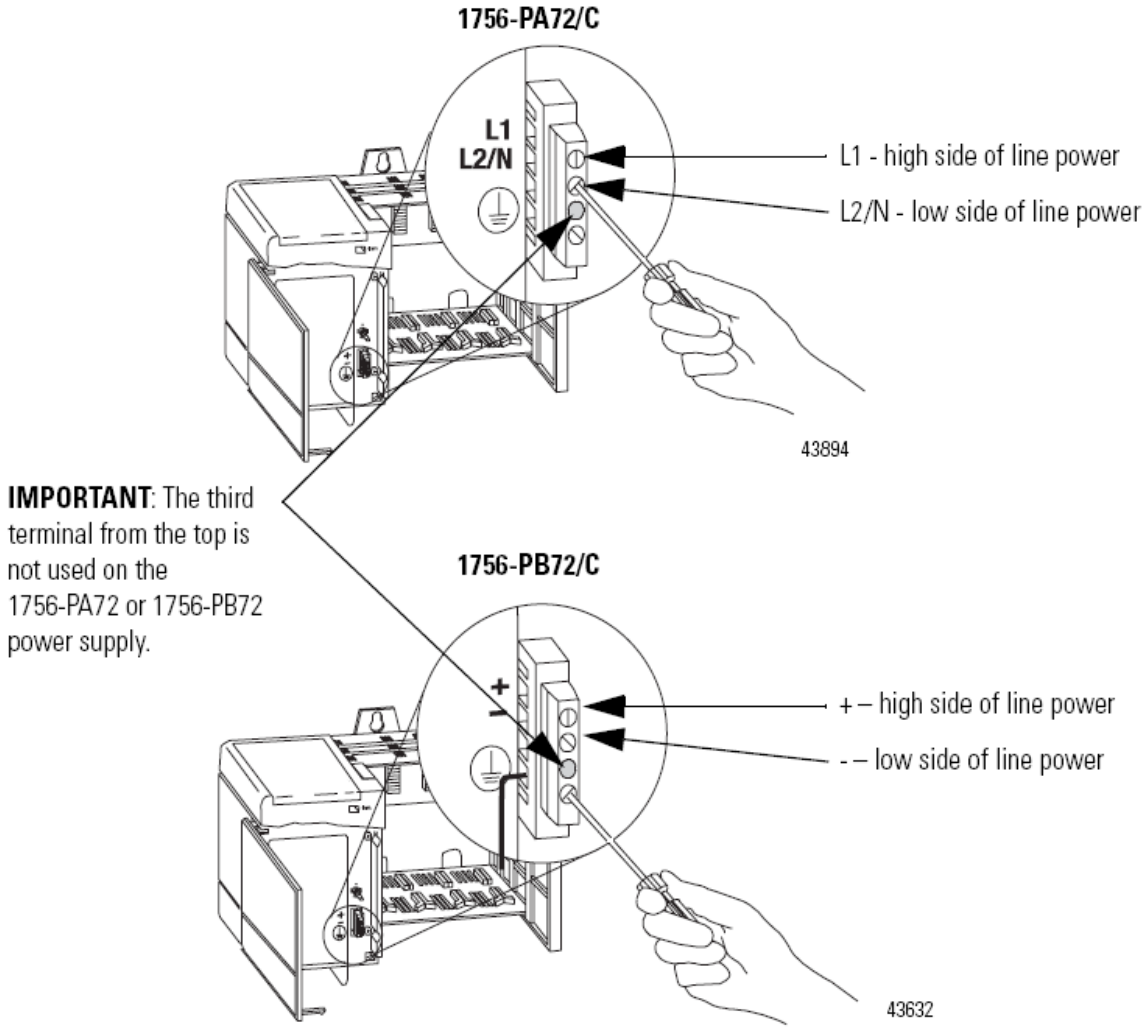

1756-PA72/C
L1
L2/N
L1 - high side of line power
L2/N - low side of line power
43894
IMPORTANT: The third terminal from the top is not used on the 1756-PA72 or 1756-PB72 power supply.
1756-PB72/C
+
–
+ – high side of line power
- – low side of line power
43632

Figure 57 - Allen-Bradley ControlLogix Power Supply Wiring

Attribute	Power Supplies					
	1756-PA72/C	1756-PA75/B	1756-PB72/C	1756-PB75/B	1756-PC75/B	1756-PH75/B
Power Supply Input Voltage, Nom.	120/240 V ac	120/240 V ac	24V dc	24V dc	48V dc	125V dc
Operating Voltage Range	85…265V ac	85…265V ac	18...32V dc❄	18...32V dc❄	30…60V dc	90…143V dc
Input Power, Max.	100V A / 100 W	100V A / 100 W	95 W	95 W	95 W	95 W
Input Frequency Range	47…63 Hz	47…63 Hz	dc	dc	dc	dc
Current Capacity, Max.	1.5 A @ 1.2V dc 4.0 A @ 3.3V dc 10.0 A‡ @ 5V dc 2.8 A‡ @ 24V dc	1.5 A @ 1.2V dc 4.0 A @ 3.3V dc 13.0 A‡ @ 5V dc 2.8 A‡ @ 24V dc	1.5 A @ 1.2V dc 4.0 A @ 3.3V dc 10.0 A‡ @ 5V dc 2.8 A‡ @ 24V dc	1.5 A @ 1.2V dc 4.0 A @ 3.3V dc 13.0 A‡ @ 5V dc 2.8 A‡ @ 24V dc	1.5 A @ 1.2V dc 4.0 A @ 3.3V dc 13 A‡ @ 5V dc 2.8 A‡ @ 24V dc	1.5 A @ 1.2V dc 4.0 A @ 3.3V dc 13 A‡ @ 5V dc 2.8 A‡ @ 24V dc
Power Supply Output	75 W @ 60 °C (140 °F)	75 W @ 60 °C (140 °F)	75 W @ 60 °C (140 °F)	75 W @ 60 °C (140 °F)	75 W @ 60 °C (140 °F)	75 W @ 60 °C (140 °F)
Hold Up Time✶	5 cycles @ 85V ac, 50/60 Hz 6 cycles @ 120V ac, 50/60 Hz 6 cycles @ 200V ac, 50/60 Hz 6 cycles @ 240V ac, 50/60 Hz		35 ms @ 18 V dc 40 ms @ 24 V dc 40 ms @ 32 V dc		50 ms @ 30…60V dc nom	50 ms @ 90…143V dc nom§
Chassis Compatibility	Series A Series B	Series B	Series A Series B	Series B	Series B	Series B
Mounting Location	Left side of 1756 chassis		Left side of 1756 chassis		Left side of 1756 series B chassis	Left side of 1756 series B chassis

Figure 58 - Allen-Bradley ControlLogix Power Supply Specifications

5.1.5.5 Allen-Bradley ControlLogix Input and Output Modules

Figure 59 - Allen-Bradley ControlLogix I/O Module

The Input and Output modules are used to connect the PLC with the field devices. The input and output modules are available in a variety of voltages and configurations to meet the needs of the system. The most commonly used modules are 115VAC Inputs and Relay Outputs.

Each module has LED indicators to show the status of each Input or Output point. These are located on the front of the module at the top. When a point is on, the LED will light, and will show up as a number to indicate which point is on.

Connections to the Input and Output modules are made by means of the removable terminal strip on the front lower half of the module. Check the schematic carefully before wiring to the module, as the location of the commons may vary from one type of module to another. The terminal blocks are removable, so BEFORE power is applied, remove the terminal blocks and check for grounds at the terminal blocks.

The removable terminal blocks are not included with the I/O modules. They must be ordered separately. The type of module determines which removable terminal blockyou need. Screw-clamp or spring-clamp removable terminal blocks are available.

NOTE: If trouble shooting assistance is required from Virginia Controls, it is very important to get the status of all Input and Output points to help identify any possible problems.

CAUTION: Be very careful not to jump to a common when you intended to jump to an input or output, as this could damage the controller or other equipment.

The addressing for the boards is handled in the software, and is pre-programmed by Virginia Controls.

5.2 Power System

5.2.1 Transformers

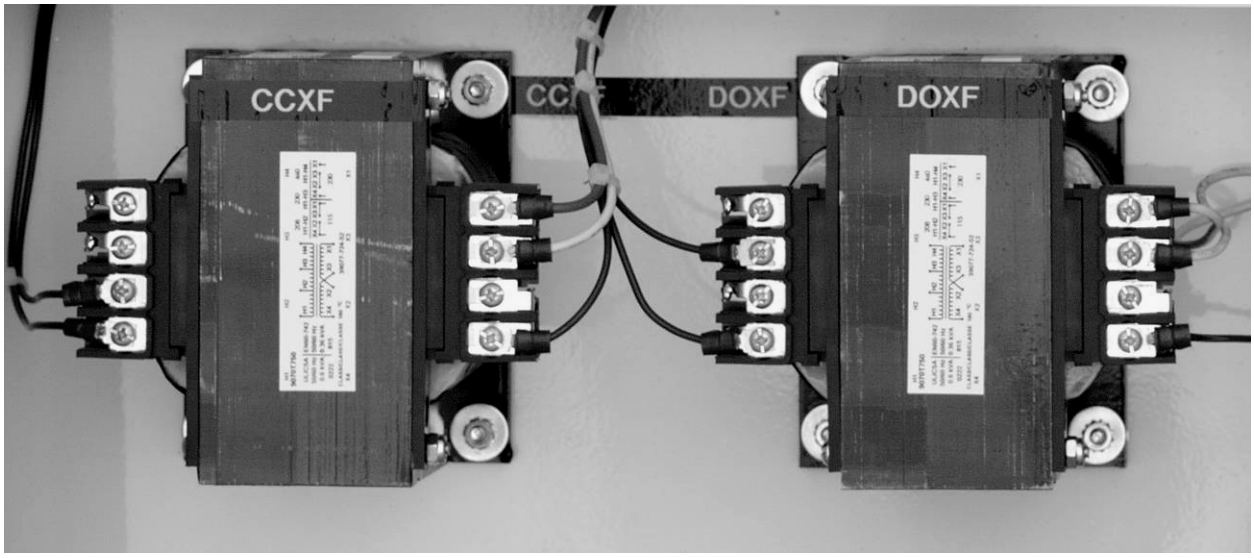


Figure 60 - Control Transformers

"CCXF" is the Control Circuit Transformer. This will provide the controller with 115VAC. The primary connections will vary depending on the Building Power. See the schematic for sizing and wiring information.

"DOXF" or "DXF" are the Door Circuit Transformer(s). The size and quantity of these transformers will depend on the type of doors used. See the schematic for sizing and wiring information.

5.3 Safety Interface Board

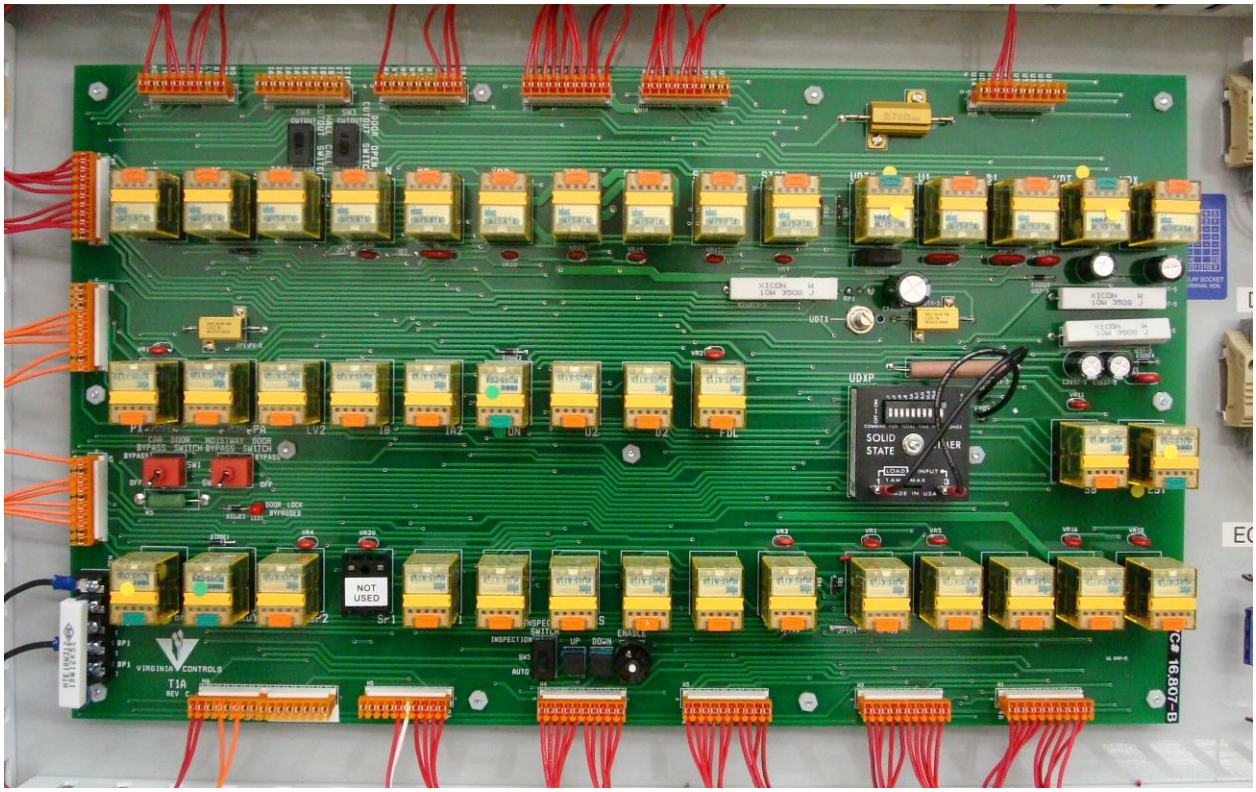


Figure 61 - Virginia Controls T1A Interface Board

5.3.1 Digiset Timers

This unit is a universal voltage solid-state timer that will operate from 19 VAC up to 265 VAC and from 10 VDC up to 120 VDC. Any time period between 0.1 second and 102.3 seconds is available in 0.1 second increments and can be set with the dip switch.

Application of input voltage to the timer starts the time delay. At the end of the delay period, the load is energized. To reset, remove the input voltage to the timer.

To select a time period, simply add up the selected switches in the “ON” position for the total time delay in seconds.

This timer provides a delay in the Up Run circuit.

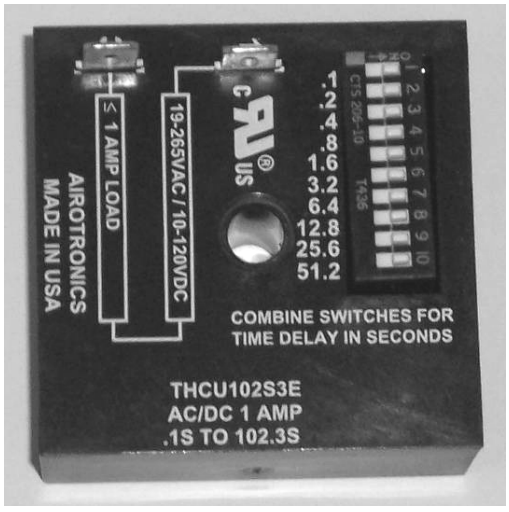


Figure 62 - Digiset Timer

5.3.2 Bypass Switches

The Bypass Switches bypass either the Car Door Contact(s) or the Hall Door Contacts, as required by the appropriate codes. They may only be used on Inspection Operation.

The code requires using these switches to run the car on Top of Car Inspection with the doors open, instead of putting jumpers around the Door Contacts.

Moving either of these switches to the Bypass position will force the car onto Inspection Operation.

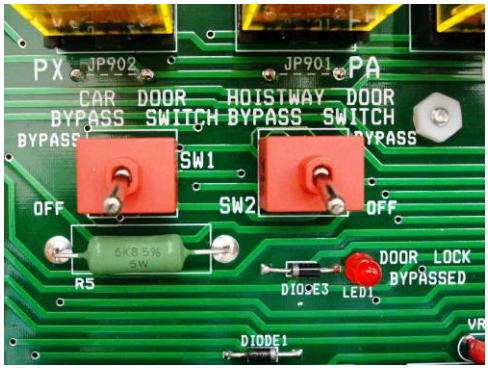


Figure 63 - T1A Board Bypass Switches

WARNING: Use extreme caution with these switches, and always make sure it is safe to operate the car with these switches closed.

5.3.3 Inspection Switches

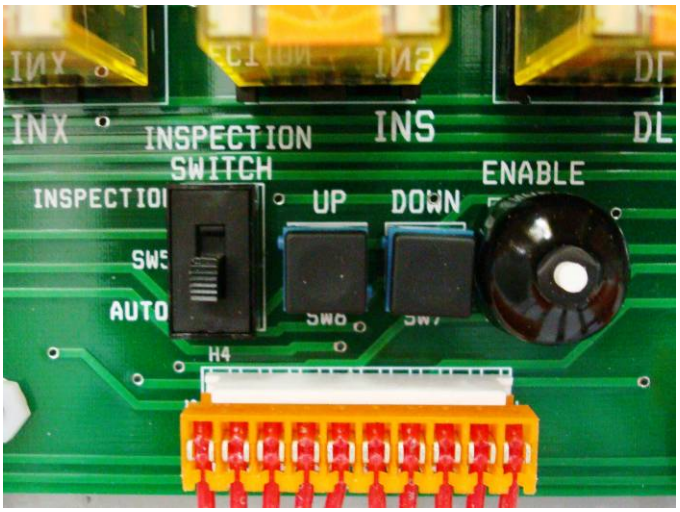


Figure 64 - T1A Board Inspection Switches

The Inspection Switches allow the elevator to be run on Inspection, in accord with the appropriate codes.

NOTE: The Controller Inspection Buttons are not active when on Car Top Inspection.

To operate the car, slide the “INSPECTION SWITCH” to “INSPECTION”, then press the “ENABLE” and “UP” or “ENABLE” and “DOWN” buttons together.

WARNING: Use extreme caution when operating the car from the machine room. Make sure it is safe to move the car.

5.3.4 Cutout Switches

Move the HALL CALL CUTOUT SWITCH to CUTOUT to cutout hall calls.

Move the DOOR OPEN CUTOUT SWITCH to CUTOUT to cutout door operation.

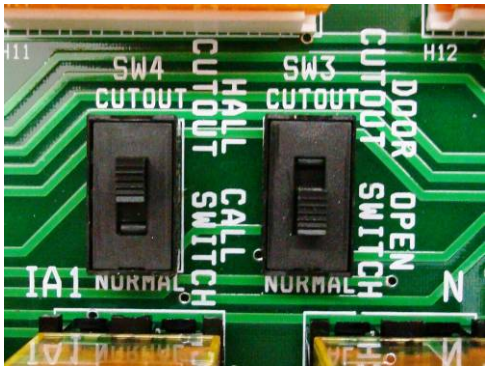


Figure 65 - T1A Board Cutout Switches

5.3.5 UDTX Potentiometer

The UDTX potentiometer adjusts the timing of the drop out of relay UDTX. It should be adjusted so that the brake drops when the elevator reaches zero speed.

(Clockwise = longer delay)

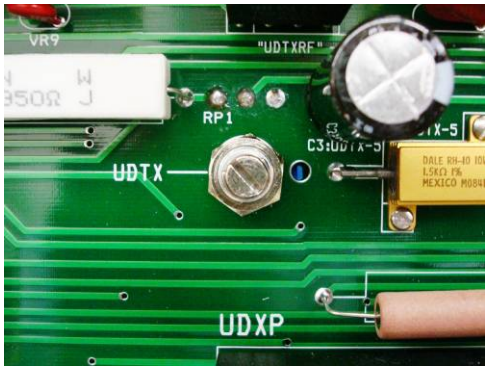


Figure 66 - T1A Board UDTX Potentiometer

5.4 ETSD Monitoring System

The ETSD board by Virginia Controls is a hardware system for traction elevator controllers, which provides a level of redundancy for a specific set of control functions required by the A17.1 Safety Code for Elevators and Escalators.

These functions are accomplished by three control sub-systems that are combined into a single ETSD Board. The three individual ETSD Board sub-systems are known as:

1. Unintended Car Movement (UCM) System
2. Over-Speed (O-S) System
3. Emergency Terminal Stopping Device (ETSD) System

The operational integrity of each of these three sub-systems is verified by the elevator controller micro-processor.

The ETSD Monitoring System includes:

1. ETSD Printed Circuit Board
2. Speed (Photo) Sensor
3. Sensor Mounting Bracket
4. Sensor Cable (30Ft/10m)
5. Striped ETSD Adhesive Tape

Figure 67 - ETSD Monitoring System

5.4.1 Unintended Car Movement (UCM) System

5.4.1.1 Requirements for UCM System

The ASME A17.1 Safety Code for Elevators, under section *Unintended Car Movement Protection,* requires a traction elevator controller be equipped to detect uncontrolled movement by the elevator away from a landing for any reason while the elevator doors are open. Upon detection, the required braking device is activated. It may act directly on the elevator ropes or on the drive sheave. This system must meet the following requirements:

- It activates if the elevator leaves the door zone of a landing, and both car and hoistway doors are open, whether on Normal operation or on Inspection.
- If the UCM System requires power for operation, then the loss of power results in the application of the UCM braking device.
- When activated, the elevator shall not be restored to operation until the UCM system is manually reset.

NOTE: Cycling power is not considered a valid reset.

- If activated, the UCM system may remove power from machine motor & brake.
- The braking device may be applied (not activated) to a stopped elevator, and may be applied (not activated) when an Electrical Protective Device (EPD) is opened.
- The UCM System is classified as an Electrical Protective Device (EPD).

5.4.1.2 Description of UCM System

1. The UCM System mimics in hardware what the controller micro-processor performs in software using a small number of signals shared between them.
2. When operating, relays RBP1 and RBP2 energize +1.0 second after power-up. Relays RBCX1 and RBCX2 remain de-energized until integrity checking is initiated.
3. If the car should move out of the door zone with its gate and hall door open, the UCM system will release relays RBP1 and RBP2 causing a UCM System fault.
4. A UCM System fault may occur in one of two situations, one occurring while on Normal operation and the other occurring while on Inspection.
    a. When on Normal operation with the elevator in the Door Zone, if the Gate and Hall Door Contacts have been open and remain open, and if the Door Zone Input is lost, then the UCM System faults.
    b. When on Inspection, if the Gate and Hall Door Contacts have been open and remain open, and the Safe Input is high (“P” Contactor is released), and if the elevator speed exceeds 2.5fpm for 1.0 second, then the UCM System faults.

5. When faulted, the UCM System lights the “UCM TRIP” LED. A UCM System fault is latched through a power loss until reset.

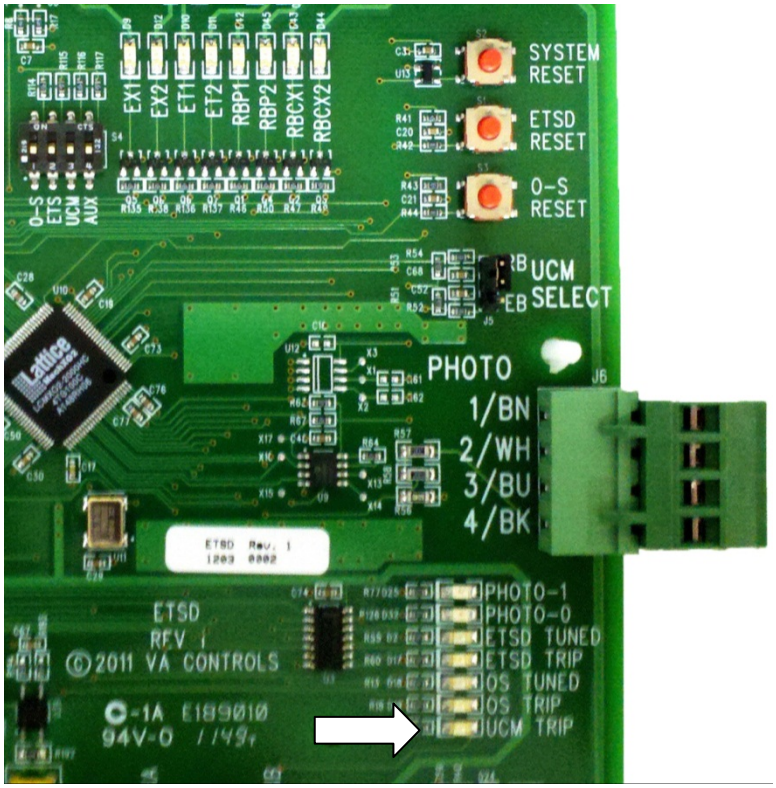


Figure 68 - UCM TRIP Indicator

6. The UCM System is reset when Input SHTDFT goes high with power on.

NOTE: Input SHTDFT defeats the UCM System if jumped at power-up, then left in place. It will not reset a UCM System fault at power-up. Use only during construction.

7. The operational integrity of the UCM system is checked prior to leaving a landing when on Normal operation and is performed differently for Rope Brake operation versus Emergency Brake operation.

8. When equipped for Rope Brake operation, the controller is provided with Relays: RB, RBX and RBC, from which UCM System Inputs RB and RBC synchronize the integrity checking of UCM System Relays: RBP1, RBP2 and RBCX1, RBCX2.

    a. To start, the processor energizes controller relay RBC causing UCM System Input RBC to go high, which prompts the UCM system to energize relays RBCX1 and RBCX2 causing TB-RCM, as monitored by the processor to go high.

    b. Next, the processor releases controller relays RB and RBX causing UCM system Input RB to go low. This prompts the release of UCM system relays RBP1 and RBP2 causing UCM system TB-RM, as monitored by the processor to go low indicating proper operation of these UCM System relays.

    c. This done, the processor re-energizes controller relays RP and RPX causing UCM Input RB to go high, prompting the UCM system to re-energize RBP1 and RBP2.

d. Lastly, the processor releases controller relay RBC causing UCM Input RBC to go low, prompting the UCM system to release relays RBCX1 and RBCX2 causing UCM system TB-RCM, as monitored by the processor to go low indicating proper operation of these UCM System relays.

9. When equipped for Emergency Brake operation, there are situations where the controller is permitted to release the Emergency Brake due to lack of demand or due to the machine manufacturer's specifications for the Emergency Brake itself. In this case, the controller is not provided with Relays RB, RBX and RBC, therefore integrity checking of the UCM system is initiated by processor Output RBC.

    a. To start, UCM System Input RBC, which is connected to processor Output RBC, goes high when integrity checking is initiated, prompting the UCM System to energize Relays RBCX1 and RBCX2 causing TB-RCM, as monitored by the processor, to go high.

    b. After a brief timed interval, the UCM system releases Relays RBP1 and RBP2 causing TB-RM, as monitored by the processor, to go low indicating proper operation of these UCM System relays.

    c. After another brief interval, the UCM system re-energizes RBP1 and RBP2.

    d. After a final brief interval, the UCM system releases Relays RBCX1 and RBCX2 causing TB-RCM, as monitored by the processor to go low indicating proper operation of these UCM System relays.

10. Any deviation from these integrity checking sequences would result in an UCM System Redundancy fault.

11. If the micro-processor detects both its inputs at TB's: RM and RCM of the ETSD Board are low, then it logs a fault of the UCM System.

5.4.2 Over-Speed System (O-S) System

5.4.2.1 Requirements for O-S System

The ASME A17.1 Safety Code for Elevators, under section *Control and Operating Circuits*, states that a failure of a software system designed without a SIL rating in circuits that control car speed while Leveling with doors open, or while operating on Inspection or Hoistway Access, shall not permit elevator speed to exceed 150fpm. A system, known as the Over Speed or O-S System, satisfies the safety code by meeting the following requirements:

- This system is not defined in the code as an Electrical Protective Device (EPD), but is described in virtually identical terms.
- A hardware based system is then used to monitor and limit car speed.

5.4.2.2 Description of O-S System

1. The O-S System provides the electronic hardware and a speed (photo) sensor, which is aimed at a striped adhesive tape affixed to the machine drive sheave, to monitor elevator speed without the need to determine elevator direction.

   NOTE: This speed monitoring hardware is also used by the ETSD System (required above 200fpm), which is calibrated at a higher percentage of contract speed.

2. The O-S System is calibrated at and operates with a 150fpm threshold.
3. When provided, the High Speed Counter of the processor is retained as a backup to the O-S System, but is calibrated at a lower speed, so it would act first.

   NOTE: The High Speed Counter of the processor is calibrated for a 125fpm threshold for running on Inspection and for a 50fpm threshold while Leveling with doors open.

4. When tuned and operating and if Input EI is high, the O-S system energizes relays EX1 and EX2 at +1.0 seconds after power-up. The O-S system also energizes relays ET1 and ET2 when the controller is on Normal operation and out of Door Zone, or when on Normal operation and in the Door Zone with doors closed.
5. Relays ET1 and ET2 are released when on Normal operation (Input Auto is high) and the elevator has been sitting in the Door Zone, and Gate and Door Contacts have been open and remain open with the Safe Input low (Drive is enabled) for 1.0 second. Relays ET1 and ET2 are de-energized on Inspection and remain so.
6. During either of these two conditions, if 150fpm is exceeded, relays EX1 and EX2 de-energize, opening the safety string and causing the O-S System to fault.

7. When faulted, the “O-S TRIP” LED lights and latches UCM System Relay XXA, Low Speed Monitor.

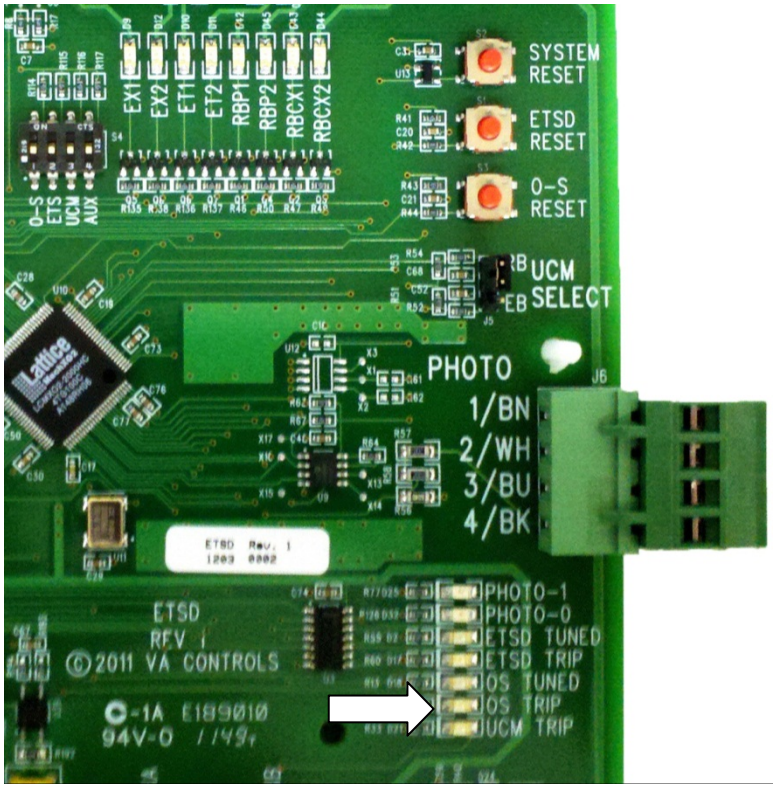


Figure 69 - O-S TRIP Indicator

NOTE: O-S System faults are latched through a loss of power.

8. An O-S System fault is reset via the “O-S RESET” Push Button or by re-tuning.

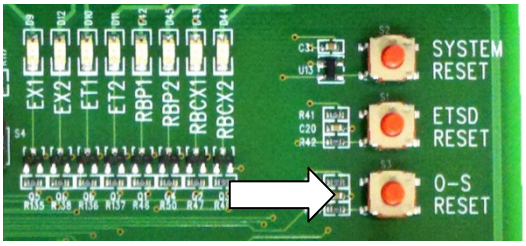


Figure 70 - O-S RESET Push Button

NOTE: If the O-S System is re-tuned, the ETSD System must be re-tuned.

9. For troubleshooting, a tuned O-S system can be defeated by jumping Input OSC high with power applied.

NOTE: Do not cycle power with Input OSC jumped or O-S calibration will be lost!

10. A tuned, but defeated O-S System maintains relays EX1 and EX2 regardless of car speed. Relays ET1 and ET2 function normally per the previous description.

11. A tuned O-S System energizes its relay XXA when car speed exceeds 150fpm. This output serves as “Low Speed Monitor” or LSM Input for the micro-processor.

12. The operational integrity of the speed monitoring system is checked as the micro-processor verifies its Input LSM (UCM Relay XXA) energizes when car speed exceeds 150fpm and de-energizes when car speed drops below 50fpm.
13. The operational integrity of Relays ET1 & ET2 is checked as the micro-processor verifies TB-ETM goes low (i.e.: Relays ET1 and ET2 drop) when on Inspection or on Normal operation when Leveling with doors open.
14. When micro-processor Input ETSD is energized, then the operational integrity of the O-S System (Relays ET1, ET2 and Output XXA) is not checked.
15. If the micro-processor detects both its inputs at TB's: EXM and ETM of the ESTD Board are low, and its Input LSM is high, then it logs a fault of the O-S System.

5.4.3 Emergency Terminal Slowdown Device (ETSD) System

5.4.3.1 Requirements for ETSD System

The ASME A17.1 Safety Code for Elevators, under section *Emergency Terminal Stopping Device*, requires a traction elevator with static control and a contract speed over 200fpm to have a speed and position monitoring system that stops the car when excessive speed is detected as the elevator approaches a terminal landing. This system, known as the Emergency Terminal Stopping Device or ETSD System, has the following code requirements:

- It is activated in response to a failure of both the normal stopping means and the normal terminal stopping device to slowdown and stop the elevator at or near a terminal landing.
- The ETSD System must function independently of the normal terminal stopping device and the normal speed control system.
- When activated, the ETSD System shall remove power from the driving machine motor and brake without regard for where the elevator comes to a stop.
- The general intent of this system is to prevent the car or counterweight from running onto their buffers at or above contract speed.
- The ETSD System is classified as an Electrical Protective Device (EPD).

5.4.3.2 Description of ETSD System:

1. The ETSD System requires a speed monitoring system with inputs for a set of hoistway switches that signal when the elevator approaches a terminal landing.
2. The speed monitoring hardware is provided for and shared with the O-S System where it is calibrated at the lower speed of 150fpm.
3. In the case of the ETSD System, the calibration speed is 80% of contract speed whenever contract speed is over 200fpm.
4. The ETSD System will verify that the elevator has slowed down to 80% of its contract speed with 50% or half of its slowdown distance remaining per the placement of Up & Down ETS Switches at TB's: 31X and 32X.

Table 2 - Recommended ETS Switch Placement (one N.C. switch per terminal/direction)

Car Speed (FPM)	Switch Placement
225	2'-3"
250	2'-6"
300	3'-6"
350	4'-3"
400	5'-3"
450	6'-6"
500	7'-6"
600	10'-6"
700	13'
800	TBD and only if used with a standard buffer

5. Minimum ETS Switch Cam lengths are 3ft for +200-500FPM, and 6ft for 500-1000FPM to provide approximately 0.33 seconds of dwell time. ETS Switches may also be maintained to the Final Limit Switch as most cam lengths are +8ft.
6. When tuned and operating and if Input EI is high, the ETSD System energizes relays EX1 and EX2 at +1.0 seconds after power-up. The ETSD System also energizes relays ET1 and ET2 when the elevator is on Normal operation (Input Auto is high) and Inputs ETU and ETD are high (off of ETS Switches in hoistway).
7. Relays EX1 and EX2 remain energized until car speed exceeds 80% of contract speed at which time they are released causing the safety string to be subject to relays ET1 and ET2. Relays EX1 and EX2 re-energize just below 80% of contract speed.
8. Relays ET1 and ET2 remain energized until the elevator rides onto one of the ETS Switches in the hoistway causing either Input ETU or ETD to go low.
9. On a "typical" full speed run into a terminal landing, the elevator decelerates below 80% of contract speed before it encounters an ETS Switch. This allows relays EX1 and EX2 to re-energize before relays ET1 and ET2 release.

10. On an “over-speed” run into a terminal landing (+80% of contract speed with just 50% of slowdown distance remaining), relays EX1 and EX2 are released by excessive car speed. Then, as an ETU or ETD Switch is encountered, relays ET1 and ET2 are released, opening the safety string and causing an ETSD System fault.
11. When faulted, the “ESTD TRIP” LED lights.

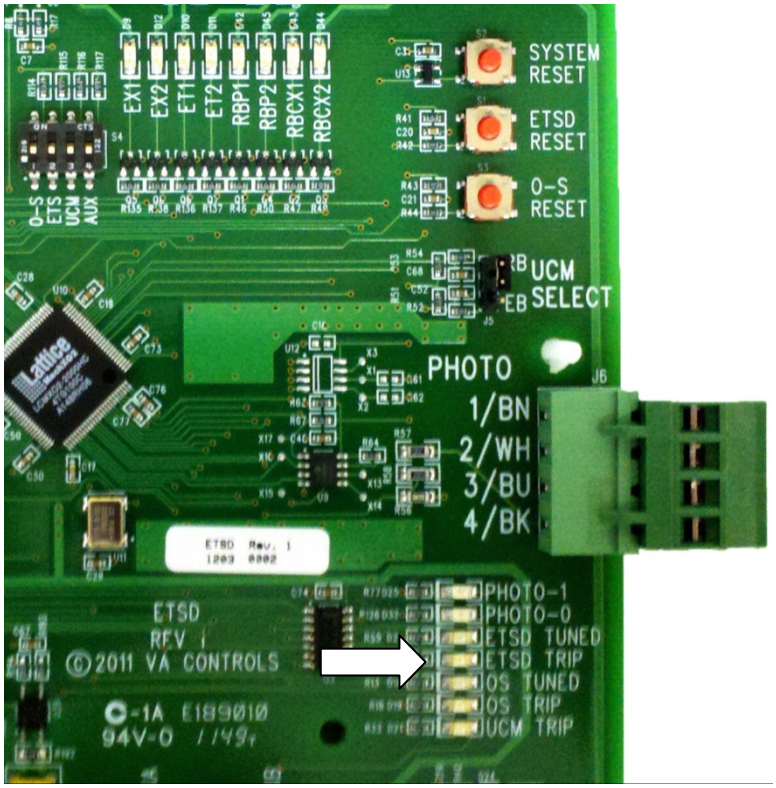


Figure 71 - ETSD TRIP Indicator

NOTE: ETSD System faults are latched through a power loss.

12. An ETSD System fault is reset via the “ETSD RESET” Push Button or by re-tuning.

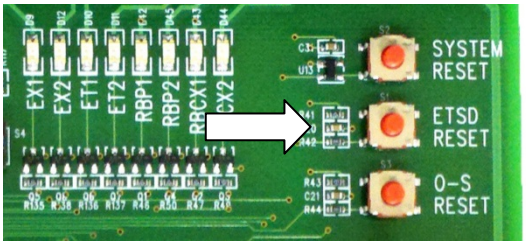


Figure 72 - ETSD RESET Push Button

NOTE: The ETSD System must be re-tuned, if the O-S System is re-tuned.

13. For troubleshooting, a tuned ETSD System can be defeated by jumping Input ETSDFT or by putting the controller on Inspection operation.
14. A defeated, but tuned ETSD System maintains relays ET1 and ET2, regardless of Inputs ETU and ETD. Relays EX1 and EX2 remain subject to car speed.

15. The operational integrity of the ETSD System is continuously checked by the controller micro-processor per the following.
16. The operational integrity of relays EX1 and EX2 is checked as the micro-processer verifies TB-EXM goes low (i.e. Relays EX1 and EX2 drop) when traveling at over 90% of contract speed on Normal operation.
17. The operational integrity of relays ET1 and ET2 is checked as the micro-processer verifies that TB-ETM goes low (i.e. Relays ET1 and ET2 drop) when the elevator encounters an ETS Switch in the hoistway (i.e. Input ETU or ETD goes low) while approaching a terminal landing on Normal operation.
18. Likewise, the micro-processer verifies that TB-ETM is high (i.e. Relays ET1 and ET2 energized) when off both ETS Switches (Inputs ETU and ETD are high).
19. When provided, the High Speed Counter of the processor provides a redundant ETSD System using the same ETS Switch Inputs, and using the motor mounted encoder to determine car speed.
20. ETS Switches, at TB-31X and TB-32X, are compared by the micro-processor against known car position. If these switches fail to open when the car slows down and stops at a terminal landing, an ETSD Hardware Fault occurs.
21. When micro-processor Input ETSD is energized, the operational integrity of relays EX1, EX2 and ET1, ET2 from the ETSD System are not being checked along with that of Inputs ETU / TB-31X and ETD / TB-32X as well.
22. If the micro-processor detects both its inputs at TB's: EXM and ETM of the ETSD Board are low, and its Input LSM is low, then it logs a fault of the ETSD System.

5.4.4 ETSD Monitoring System Routine Maintenance

1. Check the ETSD Tape for dirt, oil or grease. If present, wipe gently with a clean soft cloth until removed. Replace the tape if it becomes damaged.

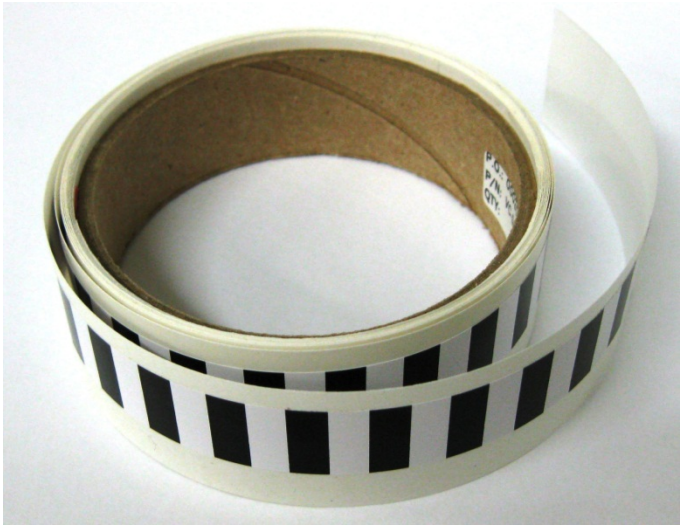


Figure 73 - ETSD Tape

2. Check the lens of the Speed Sensor for dust & dirt. If present, wipe gently with a clean soft cloth until removed.

Figure 74 - Speed Sensor

3. Check the alignment & focus of the Speed Sensor light beam. It should appear in the center of the ETSD tape as a bright red dot 1/8" in size. If otherwise, see Setup of the O-S System for Speed Sensor mounting.

4. Check for “+24V” and “+3.3V” LED’s on the ETSD Board. If not lit, check “+24V” and “COM” Test Points on ETSD Board.

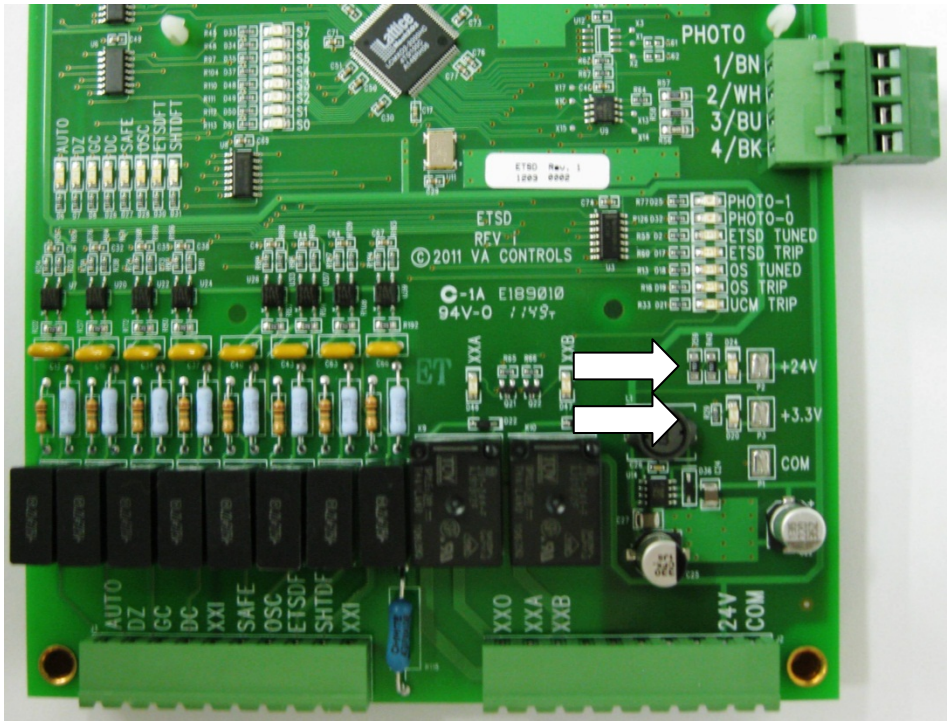


Figure 75 - +24V and +3.3V Indicators & Test Points

5. Check for the green “POWER” LED on the Speed Sensor. If not lit, check “PHOTO” Connector TB’s 1 & 3 for 24VDC.

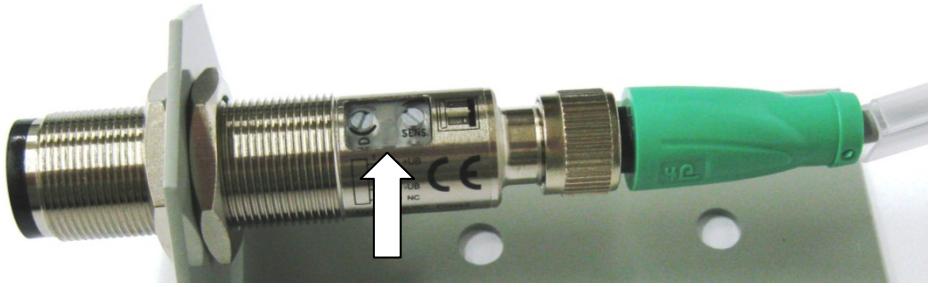


Figure 76 - Sensor POWER LED Indicator

6. Check that the yellow “SENSE” LED of Sensor and “PHOTO- 1” LED on ETSD Board operate in unison, and both are lit on a “White” segment of the ETSD Tape. If otherwise, see Setup of the O-S System for Speed Sensor adjustment.

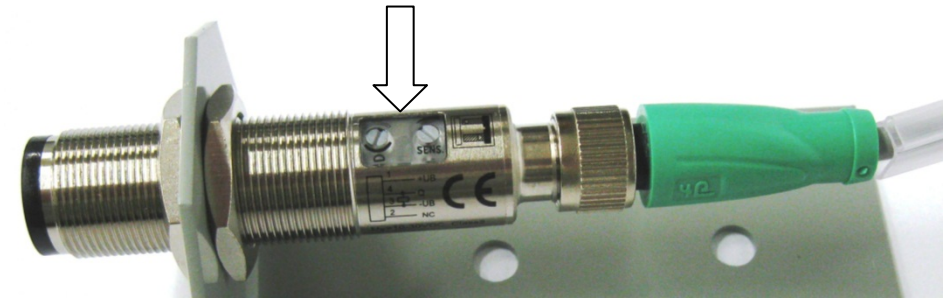


Figure 77 - Sensor SENSE LED Indicator

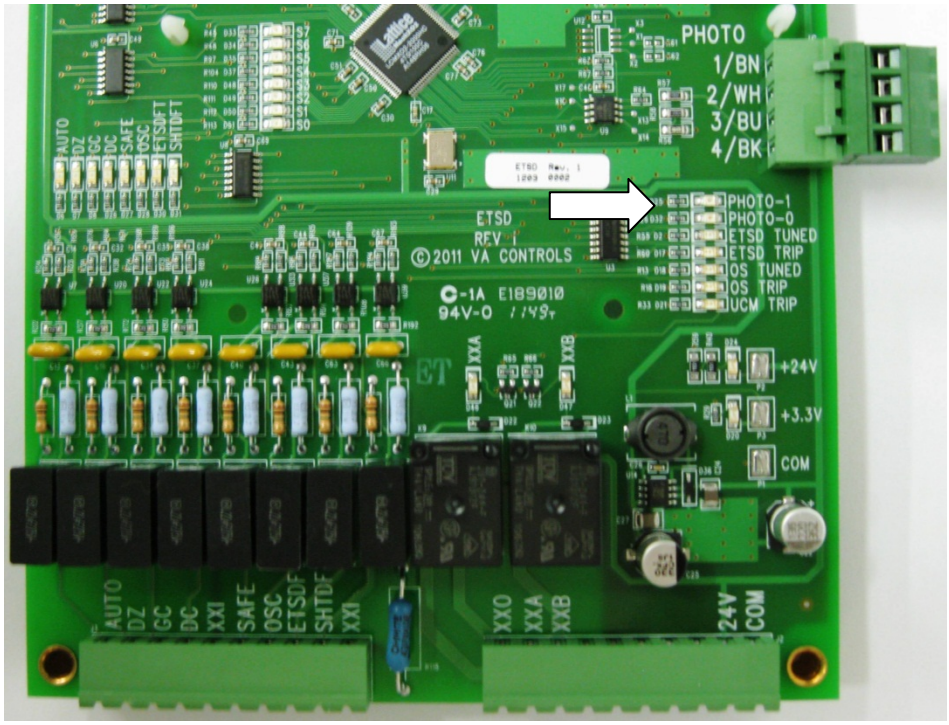


Figure 78 - PHOTO-1 Indicator

5.4.5 ETSD Board Specifications

Input Power	24VDC @ ⅓ amp (external)
On-board Power	3.3VDC
I/O	16 – 120VAC Inputs 10 – Relay Outputs
LED Indicators (Green)	+24V (voltage present) +3.3V (voltage present) 16 – 120VAC Inputs (energized) 10 – Relay Outputs (energized) ETSD TUNED (ETSD sub-system operational) O-S TUNED (O-S sub-system operational)
LED Indicators (Yellow)	PHOTO-1 (indicating white segment of ETSD tape) PHOTO-0 (indicating black segment of ETSD tape) S0 – S7 (monitors states of 3 control sub-systems)
LED Indicators (Red)	ETSD TRIP (ETSD sub-system fault) O-S TRIP (O-S sub-system fault) UCM TRIP (UCM sub-system fault)
Push Buttons	SYSTEM RESET (resets all sub-systems to initial state) ETSD RESET O-S RESET
DIP Switches	O-S; ETS; UCM; AUX (selects sub-system to be monitored)
Jumpers	UCM SELECT (selects Rope Brake or Emergency Brake operation)
Test Points	+24V; +3.3V; COM
Connectors PHOTO; 4-pole	1/BN – brown wire; +24VDC supply to Speed Sensor 2/WH – white wire; no function 3/BU – blue wire; common supply to Speed Sensor 4/BK – black wire; output signal from Speed Sensor
Dimensions	10”H x 6”W on ⅝” stand-offs
Environment Ambient Temp. Operating Temp. Storage Humidity	 32° - 104°F (0° - 40°C) 32° - 122°F (0° - 50°C) 14° - 140°F (-10° - 60°C) 5% - 95% non-condensing

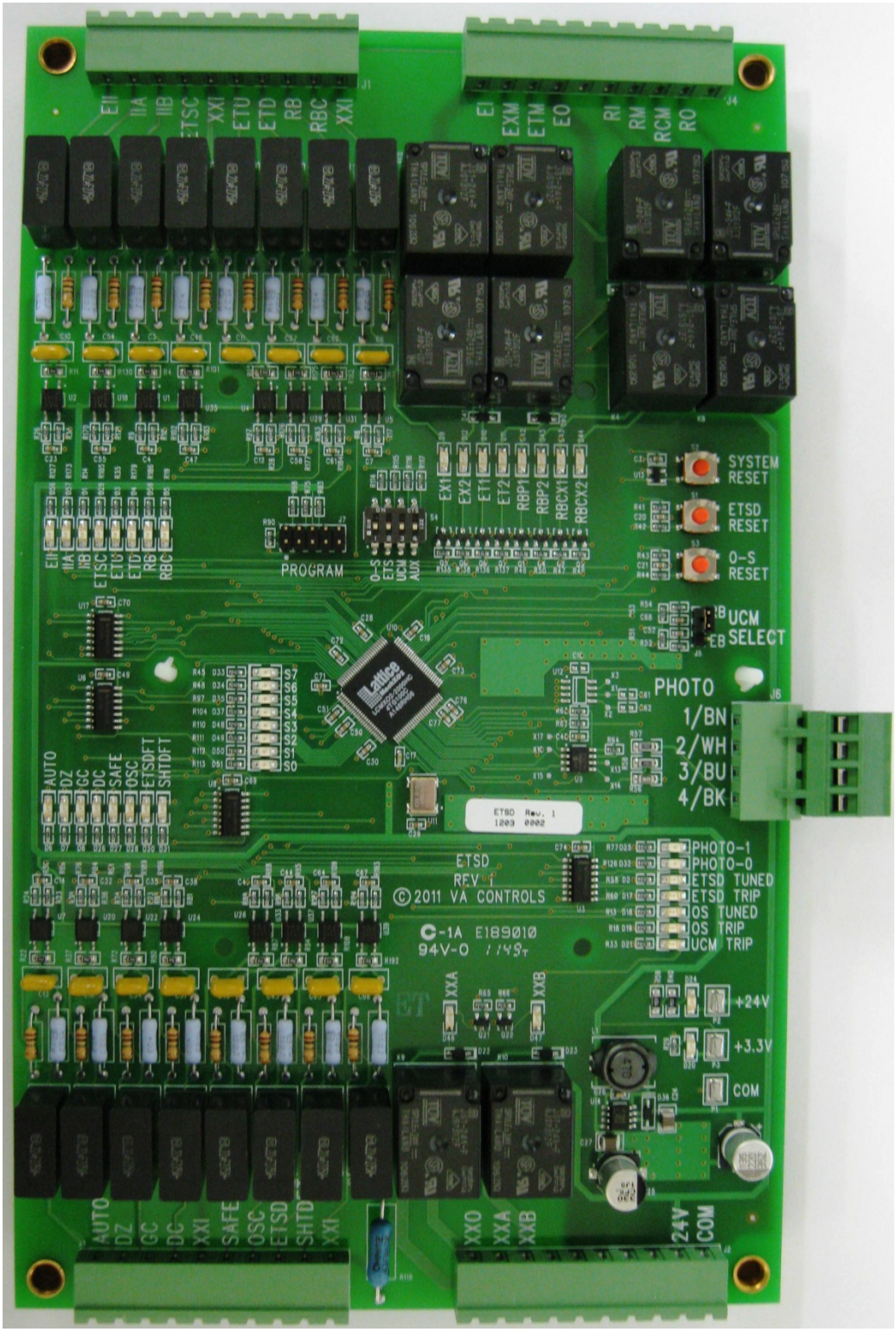


Figure 79 - ETSD Board

5.4.6 Speed (Photo) Sensor Specifications

Figure 80 - Speed (Photo) Sensor & Cable

WARNING: The Speed Sensor is Class 1 Laser Product. Avoid eye contact with Red light source.

Manufacturer	Pepperl+Fuchs
Model (Photo Sensor)	VT18-8-400-M-LAS/40a/118/128 – P/N: 810135
(Cable)	V1-G-10M-PVC – P/N: 035074 (10 meter)
ETSD Speed Tape	⅝"W x 10'L (36" max. sheave diameter); ¼" alternating black & white stripes
Mounting (Bracket)	Steel angle bracket (2 ¼-20 bolts)
(Position)	Position photo sensor slightly off perpendicular from tape by 5° - 10° to inhibit a reflection (ON state) while on "Black" surface of ETSD Tape
Distance (sensor to tape)	6"
Output	5VDC @ 9mA (ON state) square wave
Frequency (Max.)	500Hz
Speed (Max.)	1250FPM (500Hz)
(Operating)	1000FPM (400Hz; 20% safety margin)
Adjustments (Rotary Sw.)	L/D (light/dark) Default = L ***Examine carefully!***
(Potentiometer)	SENS (2-turn with clutch) Default = fully clockwise (max.)
Indicators (Green)	POWER (flashes if sensor output is shorted)
(Yellow)	SENSE (lights when beam is reflected by WHITE segment of tape)

NOTE: Be certain to retain all Pepperl+Fuchs product information for troubleshooting.

NOTE: At 1000FPM (400Hz), 1 cycle (½") takes 2.5ms; at 2.5FPM (1Hz), 1 cycle (½") takes 1 second.

6. Controller Nomenclature

SYMBOL	DESCRIPTION
AF, BF, etc.	BINARY CODED FLOOR POSITION RELAYS
BK1, BK2	BRAKE CONTACTORS
C	DOOR CLOSE RELAY (IN MODSS ON TOP OF THE CAR, IF USED)
D / D1-2, DX	DOWN RUN REVERSING CONTACTOR / RELAYS
DC	DOOR CLOSED RELAY
DL	DOWN LEVEL RELAY
DZ	DOOR ZONE RELAY
ES, EST	EMERGENCY STOP SWITCH RELAY (OPTIONAL)
ESB	EMERGENCY STOP SWITCH BY-PASS RELAY
FL, FLR	FIELD LOSS RELAYS
FS, FSX	FAST SPEED RUN CONTACTOR OR RELAYS
FSD	FAST SPEED DOWN RUN RELAY
FSU	FAST SPEED UP RUN RELAY
IAS	INSPECTION ACCESS RELAY
LC	LEVELING CUTOUT RELAY
LL	LOW LEVELING SPEED RELAY
LV	LEVELING RELAY
MG, MG1-2	MOTOR GENERATOR CONTACTOR, RELAYS
N	DOOR CLOSE NUDGING RELAY
O	DOOR OPEN RELAY (IN MODSS ON TOP OF THE CAR, IF USED)
P, PX	POTENTIAL CONTACTOR, RELAY
PM	STARTER (ACROSS THE LINE START)
PMP	PUMP MOTOR PILOT RELAY (110VDC)
RU	MOTOR RUN CONTACTOR (WYE-DELTA START)
RUX / RUXP	M.G. SET RUNNING CONTACTOR / TIMER
SAF1-2	SAFETY CIRCUIT RELAYS
STR	MOTOR START CONTACTOR (WYE-DELTA START)
SU	SUICIDE CONTACTOR
TRU	WYE-DELTA MOTOR RUN RELAY (WYE-DELTA START)
TRUP	WYE-DELTA MOTOR RUN TIMER (WYE-DELTA START)
U / U1-2, UX	UP RUN REVERSING CONTACTOR / RELAYS
UD	CAR RUNNING RELAY
UDT, UDTX	CAR RUNNING DELAY DROP OUT RELAYS
UL	UP LEVEL RELAY
VR	VOLTAGE RELAY (OPTIONAL)

7. Parts List

DESCRIPTION	MANUFACTURER	PART #
RELAYS, TIMERS & PHASE MONITORS		
4PDT, 120VAC, Plug-In Relay	Idec	RU4SA110
4PDT, 110VDC, Plug-In Relay	Idec	RU4SD110
4-Pole, Surface Mount Relay Socket	Idec	SY4S05
3PDT, 120VAC, Plug-In Relay	Potter & Brumfield	KUP-14A35-120
3PDT, 110VDC, Plug-In Relay	Potter & Brumfield	KUP-14D35-110
3PDT, 120VAC, Silver Contacts	Potter & Brumfield	KUP-14A31F-120
3PDT, 24VDC, Plug-In Relay	Potter & Brumfield	KUP-14D35-24
3-Pole, Surface Mount Relay Socket	Idec	SR3B05
3-Pole, Panel Mount Relay Socket	Potter & Brumfield	27E043
Timer, 0-102.3 Seconds	Airotronics	THCU102S3E
Phase Monitor	SSAC	TVM Series
CONTACTORS, STARTERS, OVERLOAD		
Y-D Reversing Contactor (NEMA)	Square D	8702 Series
3-Pole Thermal Overload (NEMA)	Square D	
Across-The-Line Starter (NEMA)	Square D	8536 Series
Heaters For 3 Pole Overload (NEMA)	Square D	B___
Y-D Reversing Contactor (IEC)	Telemechanique	(See Schematic)
Across-The-Line Starter (IEC)	Telemechanique	(See Schematic)
3-Pole Overload (IEC)	Telemechanique	(See Schematic)
Motor Overload (See Schematic)	Furnas	48__31AA4
Loop Overload (See Schematic)	Furnas	48__11AA4
2-Pole N.O., 120VAC Coil	Furnas	41NB20AFP
3-Pole N.O., 120VAC Coil	Furnas	41NB30AFP
3-Pole 2=N.O. 1=N.C. 120VAC Coil	Furnas	41NB21AFP
3-Pole 2=N.O. 1=N.C. 120VAC Coil	Furnas	41NB21AF36P
TRANSFORMERS, FUSES, TERMINALS		
460-230-208/230-115V, 600VA	Square D	9070T600D48
250V Instantaneous Fuse	Bussman	Type BAF
250V Fuse Holder	Klemsan	E2541000

DESCRIPTION	MANUFACTURER	PART #
Track for 250V Fuse Holders	Wago	DIN-35
3 Pole Terminal, 600V, 50A	Klemsan	K305130
Mounting Track for Terminals	Wago	DIN-35
600V Time Delay Fuse	Bussman	Type FNQR
600V Fuse Holder for Above Fuse	Bussman	R60030-1CR
PROGRAMMABLE LOGIC CONTROLLER		
CPU, With 5-Rack	GE Fanuc	IC693CPU311
CPU, With 10-Rack	GE Fanuc	IC693CPU323
CPU, Separate Module	GE Fanuc	IC693CPU350
Main Rack With 10-Slots	GE Fanuc	IC693CHS391
Expansion Rack With 10-Slots	GE Fanuc	IC693CHS392
Expansion Rack With 5-Slots	GE Fanuc	IC693CHS398
Power Supply	GE Fanuc	IC693PWR321
115VAC Input Module (16 Point)	GE Fanuc	IC693MDL240
Relay Output Module (16 Point)	GE Fanuc	IC693MDL940
In/Output Module (8in/8out)	GE Fanuc	IC693MAR590
24VDC Input Module (8 Point)	GE Fanuc	IC693MDL634
24VDC Output Module (8 Point)	GE Fanuc	IC693MDL733
Hand-Held Programmer	GE Fanuc	IC693PRG300
Replacement Battery	GE Fanuc	IC693ACC301
MISCELLANEOUS COMPONENTS AND HARDWARE		
1"W x 2"H Duct	Beta	WH1X2
1"W x 3"H Duct	Beta	WH1X3
CAPACITORS AND RECTIFIERS		
Axial Lead Capacitor, 8µf, 160VDC	Nichicon	WBR 8-160
Axial Lead Capacitor, 22µf, 160VDC	Nichicon	WBR 22-160
Axial Lead Capacitor, 47µf, 160VDC	Nichicon	WBR 47-160
Axial Lead Capacitor, 100µf, 160VDC	Nichicon	WBR 100-160
Axial Lead Capacitor, 200µf, 160VDC	Nichicon	WBR 200-160
1 Phase Idler Diode	Cougar	SA-5880
3 Phase Full Wave Bridge	Cougar	SKD-25/12
1 Phase Full Wave Bridge	Cougar	SKB-25/12

DESCRIPTION	MANUFACTURER	PART #
1 Phase F.W.B. High Current	Cougar	SA3826A
1 Phase F.W.B. Low Current	Cougar	S912
Blocking Diode, Relay Panel	Cougar	S520
RESISTORS - PART NUMBER IS RESISTANCE & WATTAGE - SEE THE SCHEMATIC		
Power Panel Resistor Values 375W = 4, 8, 10, 25Ω 200W = 50, 100, 250, 500, 1000, 1500, 2500Ω	Huntington Resistors	See schematic
Relay Panel Resistor Values 25W = 1.5KΩ 10W = 12K, 350Ω 2W = 1.5KΩ	Huntington Resistors	See schematic
MISCELLANEOUS		
Neons, On Relay Panel	I.D.I.	1030
Varistors (See Schematic For Sizes)	Movistar	V150LA2
Pushbutton, On Relay Panel	Carling	
Toggle Switch, On Relay Panel	Carling	
10 Position Selector Switch	Centralab	PA1001

Refer to the schematic for other non-standard parts.

All parts are commercially available from the manufacturer, or from Virginia Controls Inc. (ask for the Parts Department). Parts are subject to change without notice. Consult Virginia Controls, Inc., for current pricing information. Non-standard material is identified on the schematic.

8. Controller Diagnostics

8.1 PLC Mode

When the controller is powered up the PLC will be in the Run Mode. In this mode the PLC will allow the Inputs and Outputs to operate properly, and the elevator to run. (The only other mode is the Stop Mode, as described below. In the Stop Mode the elevator is shutdown, and all outputs are turned off.)

Trouble-shooting the controller is done by observing the status of the LEDs on the Input and Output modules, and may also be done with the GE 90-30 hand-held programmer, or GE Logicmaster software.

8.1.1 Putting the PLC in Run Mode (GE Series 90-30)

The PLC will normally come up in Run Mode after a power cycle. If the PLC fails to come up in the Run Mode, check that all modules are in the proper place and that all modules are fully plugged in to the rack. If a module has been swapped, a hand-held programmer may be required to restart the PLC.

A memory glitch may have put the PLC in Stop Mode, and this may be fixed by turning off power to the PLC and unplugging the battery in the Power Supply (or simply unplugging the Power Supply from the rack) for several minutes.

A faulty PLC component could prevent the PLC from coming up in the Run Mode.

The PLC can also be put in the Run Mode with the Hand-held Programmer.

1. Install the Hand-held Programmer
2. Press the RUN button
3. Press the +/- button until the display reads “Run Mode”
4. Press ENT

8.2 Factory Reset

This allows all settings and features to be reset to the factory values that are stored in the EPROM. This should be done on initial installation, and is recommended if the car has been left with power off for a long period of time.

1. Turn off the power
2. Turn the Inspection Switch to "Inspection" (or remove the field wire from terminal 23)
3. Jump terminals 1 to 21 and 22 (Up and Down Level Sw Inputs)
4. Turn the power back on for 10 seconds. Inputs A1 and A2 should both be ON, and Input A3 should be OFF.
5. Turn off the power
6. Remove all jumpers and put the car back on normal operation.

8.3 Change Settings

The adjustable settings are register values that can be changed with a hand-held programmer, the GE Logicmaster software, or by jumpers to Input Module 1. The sheet "FEATADJ" in the schematic gives a list of the registers that are available for adjustment, and also the default factory settings.

8.3.1 Change Settings with a GE Series 90-30 Hand-Held Programmer

1. Install the Programmer. The Main Menu will be displayed. (Or press MODE to return to the Main Menu.)
2. Press 2 ENT, to get into the DATA Mode.
3. Press the letter corresponding to the TYPE of coil or register to be examined or changed. (Eg: I for Input, Q for Output, M or T for Internal Coil, R for Register).
4. Enter the reference number of the coil or register to be examined, then press ENT.
5. The desired coil or register will now be shown on the top line of the display. The value may be shown in Binary, Decimal or Hexadecimal, by pressing the HEX/DEC key to cycle through the choices. Binary is recommended for coils, and Decimal for Registers.
6. To change the value, press the Right Arrow →. The value will change to a flashing cursor.

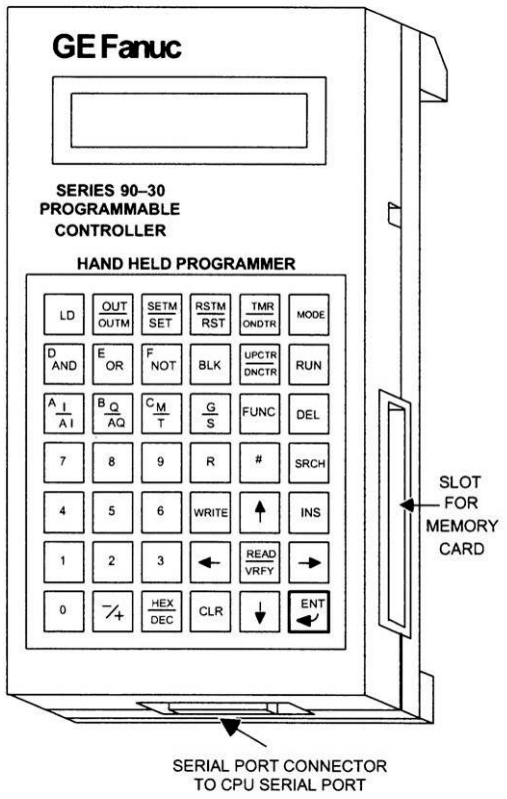


Figure 81 - GE Series 90-30 Hand-Held Programmer

7. Enter the new value. If it is a coil, enter 1 for On or 0 for Off. If it is a Register, enter the new value. Repeat steps 3-6 for all values to be changed. Timers values should be entered as tenths of a second.
8. A new coil or register may be examined by pressing the Up ↑ or Down ↓ arrow keys to scroll through the tables, or go to step 3 above and enter the desired value directly.

8.3.2 Change Settings with the GE Logicmaster Software

1. Load the software, and establish a connection with the PLC.
2. Press Alt + M to put the computer online. (Notice the status message on the bottom of the screen)
3. From the GE Logicmaster Main Menu, press F2 for Tables.
4. Type the name of the register to display in the format: %R?? or ??R (where ?? is the register number), then press Enter.
5. The register will be displayed, showing the current value. Enter the new value.

8.3.3 Change Settings with Jumpers

NOTE: This sequence normally uses two Input Modules, which are labeled Modules X and Y in the instructions below. Module X is the module with the Up Level Switch input, and Module Y is the module with the 1st Ldg Car Call Button input. Check the schematic to see which modules these are.

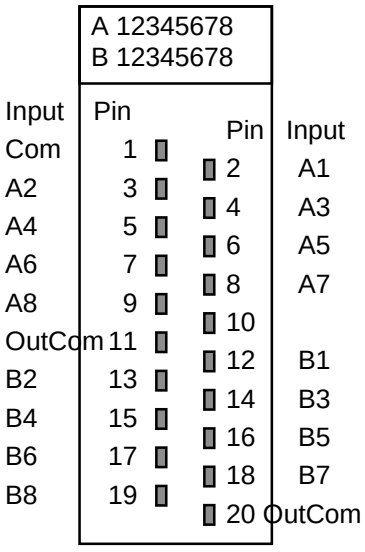
With the terminal block removed, the pins on the Input Module correspond to the Inputs as shown in the diagram below. Use the correct diagram for the module provided (the pins on the 8-In/8-Out module are different from the 16 point Input Module).

WARNING: Terminal 1 and terminal 35 refer to the 115VAC Hot and Ground terminals on the main controller terminal strip, NOT the terminals on the Input Module.

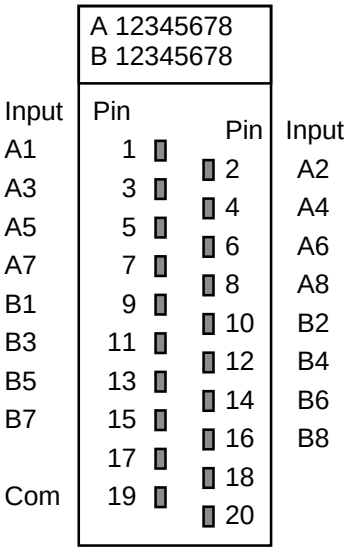
WARNING: The car will be shutdown during this procedure. Follow these steps exactly, or incorrect data may be entered.

1. **Turn off the power** to the controller, and **remove the terminal blocks from Input Modules X and Y.** Refer to the note above and the schematic to determine which are modules X and Y. (Press up on the latch behind the wiring door, and pull the tab to swing the terminal block out from the top.)
2. **Connect a jumper** from the Input Common (pin 19 or pin 1, see module diagrams) on Input Modules X and Y to terminal 35 (115VAC common).
3. **Turn the power on** now, if you want to keep previously changed values, and wait for the Run light to come on. To reset all values back to the factory default, turn the power on after the next step.

8-In/8-Out Module



16pt Input Module



4. Initiate Field Adjust Mode by **jumping Inputs A1 and A2 on Input Module X** to terminal 1 (115VAC Hot).

5. Turn the power on now, if it is not already on. Wait for the Run light to come on. **Remove the jumpers to Inputs A1 and A2**, Module X. Verify that all inputs are off on Input Modules X and Y.
6. Select the Register to be changed **by jumping terminal 1 to Module Y, Inputs A__**. Refer to the Register Select Table below for the correct inputs. Note: Leave these jumpers on until step 9.
7. Select the new value by **jumping terminal 1 to Module X, Inputs __**. Refer to the Data Select Table below for the correct inputs. Note: Leave these jumpers on until step 9.
8. Verify that the only inputs that are energized on Input Modules X and Y are the inputs that were jumped in steps 6 and 7.
9. **Momentarily jump terminal 1 to Input A8 on Module Y.** Remove the jumper to Input A8, Module Y, then all jumpers added in steps 6 and 7.
10. Repeat steps 6-9 for all registers to be changed. End the Adjustment Mode by turning the power off, remove all jumpers, and replace the terminal blocks on Modules X and Y. Turn the power back on.

To Reset all values back to the Factory Default:

1. Turn off the power to the controller.
2. Jump terminal 1 to Inputs A1 and A2 on Module X. Module X is the Input Module that has the Up Level Switch Input.
3. Remove the wire from Input A3 on Module X, or put the car on Inspection.
4. Turn the power on now. Wait for the Run light to come on.
5. Turn off the power, remove the jumpers, return Input A3 wire on Module X.
6. Turn on the power.

Register Select Table - Jumpers For A1-A7 on Input Module Y to Select the Register to Change. (See step 6 above)

The inputs A1 to A7 set a binary number that is the Register Number to be changed. In the table below, "X" indicates the input should be ON, otherwise the input should be off. Refer to the schematic sheet FA for the Register number of the features that you want to change.

Reg	A1	A2	A3	A4	A5	A6	A7	Reg	A1	A2	A3	A4	A5	A6	A7	Reg	A1	A2	A3	A4	A5	A6	A7
R51	X	X			X	X		R68			X				X	R85	X		X		X		X
R52			X		X	X		R69	X		X				X	R86		X	X		X		X
R53	X		X		X	X		R70		X	X				X	R87	X	X	X		X		X
R54		X	X		X	X		R71	X	X	X				X	R88				X	X		X
R55	X	X	X		X	X		R72				X			X	R89	X			X	X		X
R56				X	X	X		R73	X			X			X	R90		X		X	X		X
R57	X			X	X	X		R74		X		X			X	R91	X	X		X	X		X
R58		X		X	X	X		R75	X	X		X			X	R92			X	X	X		X
R59	X	X		X	X	X		R76			X	X			X	R93	X		X	X	X		X
R60			X	X	X	X		R77	X		X	X			X	R94		X	X	X	X		X
R61	X		X	X	X	X		R78		X	X	X			X	R95	X	X	X	X	X		X
R62		X	X	X	X	X		R79	X	X	X	X			X	R96						X	X
R63	X	X	X	X	X	X		R80					X		X	R97	X					X	X
R64							X	R81	X				X		X	R98		X				X	X

R65	X						X	R82		X			X		X	R99	X	X				X	X
R66		X					X	R83	X	X			X		X								
R67	X	X					X	R84			X		X		X								

Data Select Table - Jumpers For A1-B8 on Input Module X to Select The New Value. (See step 7 above)

Determine which jumpers are needed in step 7 to add up to the new value of the Register.

Input #	Value
A1	1
A2	2
A3	4
A4	8
A5	16
A6	32
A7	64
A8	128
B1	256
B2	512
B3	1024
B4	2048
B5	4096
B6	8192
B7	16384
B8	-32768

Some typical values are shown below
for 5 (0.5sec) jump Inputs A1, A3
for 10 (1.0sec) jump Inputs A2, A4
for 20 (2.0sec) jump Inputs A3, A5
for 30 (3.0sec) jump Inputs A2, A3, A4, A5
for 40 (4.0sec) jump Inputs A4, A6
for 50 (5.0sec) jump Inputs A2, A5, A6
for 100 (10.0sec) jump Inputs A3, A6, A7
for 150 (15.0sec) jump Inputs A2, A3, A5, A8
for 200 (20.0sec) jump Inputs A4, A7, A8
for 250 (25.0sec) jump Inputs A2, A4, A5, A6, A7, A8
for 300 (30.0sec) jump Inputs A3, A4, A6, B1
for 400 (40.0sec) jump Inputs A5, A8, B1
for 500 (50.0sec) jump Inputs A3, A5, A6, A7, A8, B1
for 600 (60.0sec) jump Inputs A4, A5, A7, B2

All timer values are in tenths of a second.

8.3.4 Standard Settings

The following settings are standard. The settings are stored in Registers R65 to R96. Check the schematic, sheet “FEATADJ”, to see which settings are used with a specific job.

- **Number of Landings** - (Usually Register R76) This is the number of landings that the controller can serve. This number should not normally be changed, since the inputs and outputs have to be assigned for the correct number of landings. If the controller is set up to serve future landings, then this value can be used to temporarily cut off future upper landings. This value also determines which floor the controller will reset to when a top landing reset is initiated with a pulsing selector.
- **Main Fire Landing** - (Usually Register R77) This is the number corresponding to the Main Fire Landing. The value set is based on the bottom floor being "1", the 2nd floor is "2" etc., even if this does not match the building designations. Normally, this is also the main landing on Duplex systems. On Simplex systems, if the Enable Homing feature is set, then the car will home to this landing. On Duplex systems, if the Enable Homing feature is set, then the free car will home to this floor as well as the lobby car.

CAUTION: If it is set to a value greater than the number of landings served, the car will go to the top landing, but it will not open its doors.

- **Alternate Fire Landing** - (Usually Register R78) This is the number corresponding to the Alternate Fire Landing. The value set is based on the bottom floor being "1", the 2nd floor is "2" etc., even if this does not match the building designations.

  CAUTION: If it is set to a value greater than the number of landings served, the car will go to the top landing, but it will not open its doors.

- **Alternate Home Landing** - (Usually Register R85) This is the home landing for a simplex car or for the free car in a Duplex system, if the Enable Alternate Home Landing feature has been set. On simplexes this setting is used to home the car to a landing other than the Main Fire Landing. On Duplex systems, this setting is used to home the free car to a specific floor, rather than leaving it at the last landing served. This value can be set to any valid landing, as determined by the number of landings setting.

- **Door Time, Hall** (in tenths of a second) - (Usually Register R65) This is the time in tenths of a second, that the doors will remain open, after they have opened fully, when the car has stopped in response to a hall call. After this time, the doors will start to close.

  NOTE: If a car call is entered while the doors are open, the door time will be reduced to the "Door Time, Car" setting. This setting is normally 50 tenths of a second (that is 5 seconds).

- **Door Time, Car** (in tenths of a second) - (Usually Register R66) This is the time in tenths of a second, that the doors will remain open, after they have opened fully, when the car has stopped in response to a car call only. After this time, the doors will start to close.

  NOTE: If a car call is entered while the doors are open, the door time will be reduced to the "Door Time, Short" setting. This setting is normally 20 tenths of a second (that is 2 seconds).

- **Door Time, Short** (in tenths of a second) - (Usually Register R67) This is the time in tenths of a second, that the doors will remain open, after they have opened fully, when the doors have reopened in response to a Door Open Button/Safety edge/Electric Eye/Infra-red Curtain, and no hall call is entered. After this time, the doors will start to close. The normal setting is 10 tenths of a second (that is 1 second)

- **Shutdown Time** (in tenths of a second) - (Usually Register R68) If the car runs up without passing a floor for this time, then shutdown will be initiated. The car will slowdown then stop and shutdown. The car can be returned to service by cycling the Inspection Switch, or the Main Line Disconnect Sw. The normal setting is 25 seconds.

- **Door Nudging Time** (in seconds) - (Usually Register R69) This is the time delay before initiating door close nudging, if that feature is provided. A call must be registered, and the car must be in automatic operation. The timer is reset when the doors get fully closed, or when the car starts a floor to floor run. The normal setting is 25 seconds.

- **Electric Eye Cutout Time** (in seconds) - (Usually Register R70) This is the time delay before cutting out the Electric Eye Input, after it has been continuously energized. It is reset when the car runs to the next floor. The normal setting is 20 seconds.

- **Stuck Button Time** (in seconds) - This is the time delay before calls at the same landing as the car are disabled, so that the car can answer other registered calls.

- **Door Stalled/Stuck Time** (in seconds) - This is the time delay before stopping a door open or close cycle.
- **Door Stalled/Stuck Reset Time** (in seconds) - This is the time that the doors are held open after failing to close properly, before retrying to close. If this timer is not provided, then the reset time will be the same as the Door Stalled trip time.
- **Call Help Time** (DUPLEX ONLY) (in seconds) - This is the amount of time a hall call can be registered before the other car not assigned this call will respond to the call. The normal setting is 30 seconds. Decreasing this setting may cause cars to chase each other during periods of light traffic, and increasing it may cause longer waits in periods of heavy traffic.
- **Back Call Delay** (DUPLEX ONLY) (in tenths of a second) - This is the time in tenths of a second that the back call signal will be delayed before letting the other car respond to calls behind this car.
- **Lobby Zone Bitmap** (DUPLEX ONLY) - (Usually Register R84) This is a bitmapped register that determines which floors are in the Lobby Zone. The first bit corresponds to the 1st landing, the 2nd bit corresponds to the second landing, etc. Landings that have their bit set are in the Lobby Zone, and will be served by the lobby car, other landings will be served by the free car.
- **ETSD Allowable Error** (Optional, used with ETSD only) - This sets the allowable error for the ETSD (Emergency Terminal Slowdown). If the difference between current car speed and the learned car speed exceeds the value based on this setting, at a terminal landing, then the car will shut down and stop on the Brake. This value is set to give an error equal to 30fpm, and no adjustment is normally required. Refer to the schematic for details on the operation and setup of the ETSD system.
- **ETSD Fault Delay** (Optional, used with ETSD only) (in tenths of a second) - This is the time in tenths of a second that the ETSD must detect an over speed before initiating a shutdown fault.
- **Hold Delay for One Floor Run Output** (Optional) (in tenths of a second) - This is the time in tenths of a second that the One Floor Run output is maintained after the car has started to slow down from a full speed run. It allows the car to pass the leveling switches of an adjacent floor, if necessary. This does not normally need adjustment.
- **Delay Before Stop on Earthquake** (Optional) (in tenths of a second) - This is the time in tenths of a second that the car will be allowed to run and slow down when Earthquake operation is initiated. After this delay, the car will stop, and run away from the counterweights.
- **Mid Hatch Floor for Earthquake** (Optional) (floor number with bottom landing=1) – If the car is at or above this floor, then it will run up after stopping on Earthquake. If it is below this floor, it will run down.
- **Shutdown Auto Reset Cutout Counter** (in counts) - This is the number of automatic resets allowed. If the car runs without faults for about one hour, then the count is reset to 0. To defeat automatic resets, set this value to 0 or 1.
- **Anti Nuisance Stop Counter** (Optional) (in counts) - This is the number of times the car can stop for a car call without the Electric Eye (or Infra Red Curtain) being interrupted before all car calls are cancelled.
- **Delay Drop on P Output** (in tenths of a second) - This is the time in tenths of a second that output P is held on during the stopping sequence. This does not normally need adjusting.

- **Delay Drop on PX Output** (in tenths of a second) - This is the time in tenths of a second that output PX is held on during the stopping sequence. This does not normally need adjusting.
- **Bit Mask for Long Floor Runs** (Optional) (mask value) - This value sets the floors where the car can run full speed between adjacent floors. It is only used on systems which cannot reach full speed on every one floor run. The value is a mask, in that bit 1 corresponds to the bottom ldg, bit 2 corresponds to the 2nd ldg, etc. To set a long floor, where the car will run full speed on a One Floor Run, the bit corresponding to the lower landing of the long floor pair is turned on.
- **Car Speed in FPM Divided by 10** (Optional) (in fpm divided by 10) - This is the car speed divided by 10. It is used to set the over speed values for the High Speed Counter.
- **Overspeed Fault Delay** (Optional) (in tenths of a second) - This is the time in tenths of a second that an over speed must be detected by the High Speed Counter before a shutdown is initiated.
- **Tach Loss and Wrong Direction Fault Delay** (Optional) (in tenths of a second) - This is the time in tenths of a second before the High Speed Counter checks for a Tach Loss or Wrong Direction fault. This allows the car to accelerate above 50fpm at the start of a normal floor-to-floor run. If the car is not running faster than 50fpm, or is running the wrong direction, then a shutdown is initiated.
- **Number of Drive Reset Attempts Allowed** (Optional) (in counts) - This is the number of Drive resets allowed. If the drive runs for about one hour without any further faults, the count is reset to zero.
- **Delay Before Shutting Off the Position Indicators** (Optional) (in tenths of a second) - This is the time in tenths of a second that the car must be idle before the Position Indicator outputs are turned off. This may be used to extend the life of incandescent bulbs.
- **Delay Before Initiating Homing** (Optional) (in tenths of a second) - This is the time in tenths of a second that the car must be idle before initiating a homing signal to the desired Home landing. For simplex elevators, the Homing feature must be enabled to initiate homing. For duplex systems, one car will home to the Main Dispatch landing, and the other car will remain at the last landing served, unless a different homing scheme is selected. On a duplex system, the car can be forced to home to the Main Landing, or to the Alternate Home landing as described on the FA sheet in the schematic.
- **Delay Before Allowing a Relevel** (Optional) (in tenths of a second) - This is the time in tenths of a second before allowing the car to relevel. This prevents the car from attempting to respond to a minor movement while the car is loading or unloading.
- **Delay Before Stopping From the Emergency Stop Switch** (Optional) (in tenths of a second) - This is the time in tenths of a second before the car stops when the Emergency Stop input is opened. This allows the car to decelerate before initiating the stop. This value will be modified to suit the speed of the car.
- **Delay Before Stopping From the Emergency Stop Switch** (Optional) (in tenths of a second) - This is the time in tenths of a second before.
- **Delay Before Picking the Brake** (Optional) (in tenths of a second) - This is the time in tenths of a second before the Zero Speed output is energized. This will delay the picking of the brake. This may be required in some systems to eliminate rollback.
- **Front Landing Bit Mask** (Optional) (bit mask value) - This value sets the floors where the car will open a front door. It is only used on systems with front and rear selective (walk-through) openings. The value is a mask, in that bit 1 corresponds to the bottom ldg, bit 2 corresponds to the 2nd ldg, etc.

- **Rear Landing Bit Mask** (Optional) (bit mask value) - This value sets the floors where the car will open a rear door. It is used on systems with front and rear openings. The value is a mask, in that bit 1 corresponds to the bottom ldg, bit 2 corresponds to the 2nd ldg, etc.

Some installations require specific settings or features that are not included in the standard program. In this case, refer to the Feature Adjustments sheet in the schematic for a description of these settings.

8.3.5 Standard Features

The following features are standard. The features are stored as bits in register R71. Check the schematic, sheet "FEATADJ", to see which features are available and which are set with a specific job. Each feature is either on or off.

- **No Shortened Door Time** - (Usually Bit # 1) Normally the door time will be shortened by the Door Open Button/Safety Edge/Electric Eye/Infra-red Curtain. Enable this feature to prevent these devices from shortening the door time. This is normally required in nursing homes, where the passengers need more time to enter the car. The Door Close Button will still shorten the door time.
- **Timed Electric Eye Cutout** - (Usually Bit # 2) Enable this feature to allow the Electric Eye input to be disabled after the preset time (see the setting above for the delay before cutting out the Electric Eye). This feature is often provided in the Electric Eye unit itself.
- **Door Nudging** - (Usually Bit # 3) Enable this feature to activate door close nudging. Nudging will be initiated if a call is registered and the doors have been prevented from closing for the preset Door Nudging time. The Electric Eye will be disabled, the Nudging Buzzer will come on, and the Nudging Output will come on if the Electric Eye input is energized. This means the door will only close at slow speed if the Electric Eye is blocked.

  NOTE: If Reduced Speed Nudging operation is required whenever nudging is activated, then connect the Nudging Relay to the Nudging Buzzer output.

  NOTE: Door Nudging operation requires an optional Nudging Buzzer output and Reduced Speed Door Closing output.

- **One Stroke Down Lanterns** - (Usually Bit # 4) The lanterns are normally provided with two strokes for the down direction. Enable this feature to provide only one stroke for the down direction.
- **Slow Speed on Inspection** - (Usually Bit # 5) Enable this feature to run slow speed on Inspection. This is normally required if the car speed is 150fpm or above.
- **Proximity Detector** - (Usually Bit # 6) Enable this feature if a Proximity Detector (such as an infra-red curtain) is attached to the Safety Edge Input. This feature will cause the Safety Edge input to be disabled on Fire Service, and the Door Nudging feature to be initiated while the doors are closing on Fire Service.

  NOTE: Door Nudging operation requires an optional Nudging Buzzer output and Reduced Speed Door Closing output.

- **Pulsing Selector** - Enable this feature if a pulsing selector arrangement is used instead of floor switches.
- **Floor Switches** - Enable this feature if Floor Switches are used instead of a pulsing selector arrangement.
- **Disable Fire Service** - If this feature is enabled, then Fire Service Phase 1 and 2 will be disabled.

- **Enable Duplex Operation** - If this feature is enabled, then the Duplex circuitry will be enabled. Note: The controller must be set up for duplex operation.
- **Enable Alternate Landing Homing** - Enable this feature to home the free car of a Duplex system, or to home a Simplex car to the Upper Home Landing when it has been idle for the adjustable Homing delay time. If this bit, and the Enable Homing bit, is not set then the car will remain where it last stopped.
- **Enable Homing** - Enable this feature to enable the homing feature on a Simplex or the free car of a Duplex. This will cause the car to home to the Main Fire Landing when it has been idle for the adjustable Homing delay time.

NOTE: On a Duplex, one car will always home to the Dispatch Main Landing, and, if this feature is set, then the FREE car will also home to the Dispatch Main Landing. Refer to sheet FA in the schematic to see the options for homing.

- **Disable Forced Reset** - Enable this feature if the selector cannot provide a reset target long enough to cover the Door Zone, at the terminal landing on Pulsing Selector installations. This bit is set on PCTS (Programmable Car Top Selector) selectors, but is NOT set on IP8300 type systems.

NOTE: In either case reset targets should be provided at the terminal landings.

- **Enable Main and Alternate Landing Resets** - Enable this feature if inputs and switches are provided for Main and Alternate Landing Position Resets. If these are not provided, then Pulsing Selector systems will reset at the terminal landings only.

The following features are not standard, but may be provided as required for specific jobs. Check the schematic, sheet "FEATADJ", to see which features are available and which are set with a specific job.

- **Disable Checking of Running Input(s) for Sequence Fault** – The running inputs, which include the Brake Micro Switch input, the Drive On input and the Safe input, are checked against the internal run signals. If they do not match for 3 seconds then a sequence fault is indicated and the car will shut down. Enable this feature to turn off this check. This feature should not normally be changed, since the fault can be temporarily disabled by means of the Shutdown Defeat Input.
- **Disable Automatic Timed Cutout of Position Indicators** – The Position Indicators are turned off after the car has been idle for preset time. If this feature is not required then turn on this feature.
- **Disable Anti-Nuisance Car Call Cancellation** – Anti-Nuisance Car Call Cancellation will cancel all car calls if the car stops for a car call three times without the Electric Eye (or Infra Red Curtain) being interrupted. Group systems usually will also cancel all car calls if the number of car calls registered exceeds a preset number. Anti-Nuisance Car Call Cancellation can be defeated by turning on this feature.
- **Disable Door Close on Inspection** – The doors will close when a Run button is pressed while the car is on Inspection. If the doors should be closed manually, then turn on this feature. The door close output will still be energized when the doors are fully closed and the car is running.
- **Disable High Speed Counter Automatic Value Reset** – When power is applied to the controller, the program calculates the High Speed Counter values that determine whether the car is over speeding. These values are based on the setup value set when the High Speed Counter was calibrated. The values correspond to 110% of contract speed, 150fpm and 50fpm and are used to detect if the car is over speeding on automatic, Inspection or with the doors open. Custom values can be entered, if

desired, by turning this feature on, then manually setting the High Speed Counter trip values in the appropriate registers. It is recommended that the program be allowed to calculate the values automatically.

- **Enable Door Preopening in the Door Zone** – Turn on this feature to allow the doors to start opening when the car reaches the Door Zone, which is 3 inches before the floor.
- **Disable Drive On Input Check** – Turn on this feature to prevent the program from checking the status of the Drive On input while the car is running. Normally the car will shut down if the Drive On input drops out while the car is still running. This would allow the car to stop immediately if there is a problem with the drive.
- **Allow run on Emergency Power and Fire Service Phase 2** – The car will shut down if the system is on Emergency Power and Fire Service (either Phase 1 Recall at the Main Landing, or Phase 2 at any landing) and the Emergency Power Select Switch is not activated. If the car should be able to run on Fire Service and Emergency Power even if the Select Switch is not activated then enable this feature.
- **Enable Fire Shunt Trip on Inspection** – Turn on this feature if the Shunt Trip feature should bae allowed to operate when the car is on Inspection operation.
- **Disable Fire Shunt on Fire Service Phase 2** – Turn on this feature if the Shunt Trip feature should NOT operate when the car is on Fire Service Phase 2 (Car).
- **Enable CKO on Independent** – Turn on this feature if the CKO output should energize when the car is on Independent Service. The CKO output is used to override any devices that disable the car call buttons (such as Car Call Cutout Switches or Card Readers). Enabling this feature will allow car calls to be registered without using the car call security devices.
- **Park with doors open on Emergency Power** – Turn this feature on to allow the doors to park open after the car has returned to the Main Landing on Emergency Power.
- **ETSD Switches are Normally Open** – Turn this feature on if the ETSD (Emergency Terminal Slowdown) switches are normally open. The default is normally closed switches that open when the car reaches the terminal landing.
- **Disable ETSD Switch Checking** – Turn this feature on to prevent the checking of the ETSD Switches when the car arrives at the terminal landing. Normally the car must trip the ETSD switches as it approaches the terminal landing, to verify that the switches are operating properly.
- **Enable FDL on Fire Phase 2** – Turn this feature on to allow the car to automatically run down to a floor if the car stops between floors for some reason. The default (with this feature off) is to require the fireman to press a car call button or door close button to indicate it is safe to move the car. Check the applicable codes before changing this setting.
- **Manual Select on Emergency Power (Off=Auto Select)** – Turn this feature on to require the Emergency Power Select Switch to be enabled to operate the car on Emergency Power. With the feature off, the car will be automatically selected. A simplex car will then be allowed to return automatically, but must be selected by means of the Emergency Power Select Switch to run after it has returned. A car in a group will return automatically, but must be selected manually, if this feature is enabled, in order to run after it has returned.
- **Enable Remote Bldg Fire Sw** – Turn this feature on to enable the Remote Fire Switch input. Refer to the applicable codes for the operation of this switch.

- **Enable Hall Lantern Outputs** – Turn this feature on to use the Car Lantern outputs as Hall Lanterns. This will enable the outputs when the car reaches the slowdown point for the floor, instead of waiting for the car to stop and the doors to open.
- **Disable Return Latch on Fire Service Phase 2** – Turn this feature on to allow Fire Service Phase 2 Return to be cancelled if the Car Fire Switch is turned away from the "Off" position while the car is running. Refer to the applicable codes to see if this is allowed.
- **Enable Grey Binary PI** – Turn this feature on to format the Binary Position Indicator outputs as Grey code, instead of pure binary. This must match the requirements of the Position Indicators used.
- **Enable Baldor Drive** – Turn this feature on if a Baldor Drive is used.
- **Enable DC Drive** – Turn this feature on if a DC drive is used.
- **Enable Emerg Terminal Slowdown** – Turn this feature on if the ETSD (Emergency Terminal Slowdown) system is used.
- **Enable Position reset at Main** – Turn this feature on if a specific reset is provided at the main landing.
- **Enable C-T Drive** – Turn this feature on if a C-T drive is used.
- **Run Full Speed on Two Floor Run, Not One Floor Run** – Turn this feature on if the car speed and floor heights are such that the car cannot reach full speed on every one floor run. This setting is normally set in the factory based on the data supplied for the job, and should not normally need to be changed.
- **Enable 2000 Code Fire Service** – Turn this feature on to use the 2000 or later ANSI Fire Code.
- **Enable 2005 Fire Code** – Turn this feature on to use the 2005 or later ANSI Fire Code.
- **Enable RopeBrake** – Turn this feature on to enable the Rope Brake feature. The Rope Brake will be activated any one of the following situations is detected: (1) the car moves out of the Door Zone with the doors open; (2) the Brake fails to drop when the car has stopped, as indicated by the Brake Micro Switch; (3) the car speed drops below 50fpm as the car is stopping, then rises above 50fpm; (4) the car speed is over 50fpm and the run signals have been off for 5 seconds. The Rope Brake is reset by jumping the Shutdown Defeat Input on. If the Shutdown Defeat is already on, then it must be turned off then turned back on.
- **Enable CS0386 Drive Software** – Turn this feature on to enable the circuitry that complies with the CS0386 drive software. This will enable the FDL (False Down Level) output during normal operation, which allows the drive speed commands to be cumulative, rather than discrete.
- **Enable Internal Stop Sw Bypass** – Turn this feature on if the Stop Switch Bypass on Fire Service is to be accomplished in software, rather than external to the PLC.
- **Enable Emergency Power Operation** – Turn this feature on to enable Emergency Power operation.
- **Enable HPV-Open Loop** – Turn this feature on if the drive is an HPV Open Loop drive. This feature affects the timing of the PX output.
- **Enable Blower OL Input** – Turn this feature on if the drive blower is monitored for proper operation. With this feature enabled, then if the Blower OL Input goes off, the car will return to the main landing and shut down.

- **Enable Blower Shutdown on Inspection** – Turn this feature on if the Blower OL Input is used, and it is desired to allow the car to shut down if the Blower OL Input goes off while the car is on Inspection operation.
- **Enable Blower Shutdown on Fire Service** - Turn this feature on if the Blower OL Input is used, and it is desired to allow the car to shut down if the Blower OL Input goes off while the car is on Fire Service Phase 2 (Car).
- **Enable Drive Reset Counter** – Turn this feature on to enable the Drive Reset Counter. This counter will allow the drive to attempt to reset a preset number of times. If the drive cannot run without faults after this, then the car will shut down. If the car runs without a fault for about one hour, then the count will be reset to zero.
- **Disable Redundancy Fault Check** – Turn this feature on to disable Redundancy Faults. To temporarily defeat Redundancy Faults, such as during initial startup, it is recommended that the Redundancy Defeat Input or the Shutdown Defeat Input be used.
- **I-SAFE=Off When Stopped** – Turn this feature on if the SAFE input is off when the car is stopped. The factory default is that the SAFE input is on when the car is stopped..
- **Flash Hall Fire Light** – Turn this feature on if the Hall Fire Light should flash when the car Fire Light is flashing (such as when the Machine Room Heat Sensor trips)..
- **Enable Door Security** – Turn this feature on to prevent the Door Open Button or Safety Edge or Electric Eye from opening the doors on systems with front and rear selective (walk-through) doors when the doors are already closed. This allows the doors to be somewhat secured, in that card readers or security switches may now be used to allow access to specific floors.
- **Door Check Circuitry** - If the appropriate I/O is provided, and this feature is enabled, then the doors will be held open if the Car or Hall Door Contacts Input is energized, but the doors are still open.
- **Attendant Light Operation** - If this feature is disabled, the Attendant direction lights will show whether calls in each direction are registered, thus both direction indicator lights may be on. If this feature is enabled, the Attendant direction lights will show which direction is selected, thus only one direction indicator light will be on at a time.
- **Medical Emergency Buzzer Operation** - If this feature is disabled then the Medical Emergency Light output will come on while the car is returning to the Medical Emergency Landing. If this feature is enabled, then the Medical Emergency Light output will come on when the car is on Independent Service and a hall Medical Emergency Key Switch is turned on.
- **Fire Service Main Landing Opening** - If this feature is enabled, the Fire Service Main Landing will use the rear door if there are selective doors at that landing.
- **Fire Service Alternate Landing Opening** - If this feature is enabled, the Fire Service Alternate Landing will use the rear door if there are selective doors at that landing.
- **Single Button Collective Operation** (SAPB Only) - This feature is enabled to select Single Button Collective Operation. This is used with SAPB controllers only.
- **In Use Light Operation** (SAPB Only) - This feature is enabled to make the In Use Lights on SAPB controller operate while the doors are open or the car is running.

- **Freight Door Automatic Close Enable** (SAPB Only) - This feature is enabled to activate the Automatic Door Close outputs for freight doors on SAPB controllers. The freight door controller must have the automatic door close feature to use this feature.
- **Freight Door Automatic Close from Hall** (SAPB Only) - This feature is enabled to activate the Automatic Door Close operation from Hall Call Buttons, on SAPB controllers. The freight door controller must have the automatic closing feature to use this feature.

Some installations require specific settings or features that are not included in the standard program. In this case, refer to the "FEATADJ" sheet in the schematic to see the operation of these settings or features, and what the factory default settings are.

8.4 Fault Logging

The fault logging feature will store the last 50 faults, with all faults held through power loss. Each fault has an associated time code recorded with the fault. The faults are stored in Registers R401 to R450 (in Fault Log Version 1) or in Registers R401 to R500 (in Fault Log Version 2 and later).

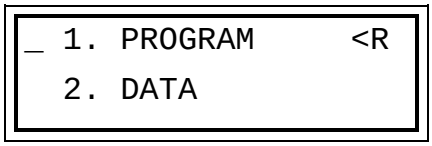
The Fault Code is the Left 2 digits of the Fault Table Value when viewed in Hexadecimal. For example, if the Fault Code Value was "0312H" then the Fault Code is "03". Compare the value in the Fault Code Value with the chart below to determine what the fault was. The Fault Codes below are in Hexadecimal.

The Fault Log Version 2 uses two registers to record the Fault Code, Time Stamp, and a Status Code that indicates the status of the elevator at the time of the fault. The codes are examined in the same way as described below, with the Fault Code in the odd numbered registers, and the associated Status Code in the next even numbered register.

The Fault Log instruction sheet for the correct version installed in the controller is part of the schematic.

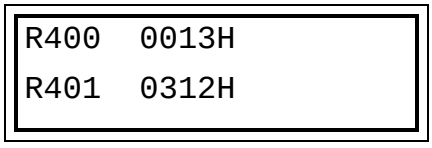
8.4.1 Examining the Fault Table with a GE Series 90-30 Hand-Held Programmer

1. Plug in the Hand-held programmer into the port on the 9030 Power Supply. It is usually best to do this with the POWER OFF. The Programmer will perform a self-test when power is applied, then it



will show the Main Menu:

2. Press [2] [ENT], to go to the Data Sub-menu.
3. Press [R] or [4] [0] [0] to show the status of Register R400. This is the Time Stamp Register, and it shows the current time. The number increments every 6 minutes. Use this value to compare with the fault codes to determine when the fault occurred.
4. Display the value in HEXADECIMAL, by pressing the [HEX/DEC] key until the display shows the Register number on the left, and the value on the right as 4 digits with an "H" after the number. For example:



5. The actual Fault Codes are in the Fault Table, which is Registers 401 to 450 (or 401 to 500). The most recent fault is in Register R401, followed by the next most recent in Register R402, etc. To view the faults, press the Up or Down Cursor keys to scroll through the Fault Table. In Fault Log Version 2, the most recent Fault Code is in R401, and the Status Code is in R402. The next fault is in

R403 and R404, etc. Each fault entry is stored in two registers, with the Fault/Time code in the odd numbered register, and the Status Code in the next even numbered register. To view the faults, press the Up [↑] or Down [↓] arrow keys to scroll through the table.

6. The Fault Code is the Left 2 digits of the Fault Table Value when viewed in Hexadecimal. For example, if the Fault Table Value was "0312H" then the Fault Code is "03".

7. The Time Stamp is the Right 2 digits of the Fault Table Value when viewed in Hexadecimal. For example, if the Fault Table Value was "0312H" then the Time Stamp is "12". The Time Stamp is a copy of Register R400 when the fault occurred, so comparing the value to the current value of Register R400 will show when the fault occurred. (In the example above, where the current Time Stamp is "0013H", and the Fault Code "03" occurred about 6 minutes ago.)

   NOTE: The Time Stamp is a hexadecimal number, not a decimal number.

   NOTE: Every 24 hours, the value of Register R400 will "roll over", resetting back to zero. A Fault Code of "0000H" is inserted in to the Fault Table, to indicate that faults before this code are from the previous 24 hour time period. If the Fault Table has several values of "0000H" then the car has run for several 24 hour periods without a fault.

   NOTE: If power is removed from the controller, then Register R400 will not increment.

8. The Status Code (used with Fault Log Version 2 only) shows the elevator status at the time of the fault. Each bit shows a different function. Press the [HEX/DEC] key to change the register display mode from Decimal to Hexadecimal to Binary. Compare the bits in the bottom line of the display to determine the elevator status. (The "?" indicates the bit(s) assigned to each function) Most faults use the definitions listed here. Redundancy faults have custom definitions to assist in determining what caused the redundancy fault.

   NOTE: Refer to the appropriate table below to determine the car status for Redundancy Faults.

   NOTE: Refer to the schematic for the instructions and definitions of the Fault Log Table for each specific job.

8.4.2 Fault Log Status Code

The Status Code is a 16-bit word in the Fault Log following the Fault Log Fault/Time Code. It is in the even numbered registers.

STATUS CODE for NORMAL FAULTS

For all faults except Redundancy faults the Status Code word is broken down as follows. If the corresponding bit is ON then the condition was true at the time of the fault.

[xxxxxxxxxxx**?????**] Bits 1-5 = Floor Position as Binary Number
[xxxxxxxxxx**?**xxxxx] Bit 6 = Car had a Up Direction
[xxxxxxxxx**?**xxxxxx] Bit 7 = Car had a Down Direction
[xxxxxxxx**?**xxxxxxx] Bit 8 = Car was Running
[xxxxxxx**?**xxxxxxxx] Bit 9 = Car was Running Fast Speed
[xxxxxx**?**xxxxxxxxx] Bit 10 = Car was on a Floor-to-Floor Run
[xxxxx**?**xxxxxxxxxx] Bit 11 = Door Contacts Input was ON

[xxxx**?**xxxxxxxxxxx] Bit 12 = Door Close Limit Input was ON **
[xxx**?**xxxxxxxxxxxx] Bit 13 = Door Open Limit Input was ON
[xx**?**xxxxxxxxxxxxx] Bit 14 = Up Level Switch Input was ON
[x**?**xxxxxxxxxxxxxx] Bit 15 = Down Level Switch Input was ON
[**?**xxxxxxxxxxxxxxx] Bit 16 = Door Zone Switch Input was ON
(** Bit 12 monitors Door Locks with Freight or Manual Doors)

STATUS CODE for REDUNDANCY FAULTS

For the Redundancy Faults, the fault will be shown by an ON bit. Look through the Status Code word for the bit that is on, and find the corresponding condition that would cause that fault. Look for a stuck relay, stuck Input, stuck Output, a jumper or a short as the possible cause for the fault.

In the descriptions, the Input or Output name or terminal marking is shown. Refer to the schematics for the location of the Input or Output. The names shown are the standard names. These may be different on specific jobs. Refer to the schematic for the exact wiring and names used.

Bit	Fault 1C	Fault 1D	Fault 1F	Fault 20
1-5	Floor #	Floor #	Floor #	Floor #
6	RB6=on, RB,RBX=off	21,22=off LV=on	DF=on, DFM=off	IN6, INS=on
7	RB6=on, RB,RBC=off	21,22,LV=on	DF=off, DFM=on	IN6=on,4=off
8	RBC6=on, RBC=off	DZ=off, LV=on	5=off, DFM=on	IN9, INS=on
9	3=off, SBM=on	LV=on, 3=off	5X=on, 3=off	IN9=on, 4=off
10	SB=off , SBM=on	UD1 on after stop	3X=on, 3=off	4A, INS=on
11	Not used	UD2 on after stop	4X=on, 4=off	4A=on, 4=off
12	Not used	UD1=on, 3=off	5=on, 4=off	5E, INS=on
13	Not used	UD2=on, 3=off	4=on, 3X=off	5E=on, 4=off
14	Not used	Not used	Not used	5G, INS=on
15	Not used	Not used	Not used	5G=on, 4=off
16	Not used	Not used	Not used	Not used

To view the Fault codes with the GE Logicmaster software, from the main menu press F2, for Tables. View register R400, by typing %R400 then pressing Enter. Change the registers to Hexadecimal display, by pressing F10 then F5.

8.4.3 Fault Log Memory Addresses

Register Version 1	Register Version 2	Description

%R400	%R400	Current Time Stamp Code. This is a number between 00 and FF(hexadecimal, or 255 decimal) that is used as a time stamp code. The number increases by one every six minutes. By subtracting the time code of a particular fault from the current time code, you can determine how long ago the fault occurred. For example, if the time code for a fault is 14, and the current time code is 16, then the fault occurred 2 time periods ago which is 12 minutes. Remember that the time code is a hexadecimal number, not decimal. To convert to a decimal number, multiply the left (most significant) digit by 16, and add to the right (least significant) digit. The letter A(hex)=10(dec), B(hex)=11(dec), C(hex)=12(dec), D(hex)=13(dec), E(hex)=14(dec), F(hex)=15(dec). Every 24 hours, the value of the current time code will roll over, resetting from "EF" to "00". A fault code of "00 00" is inserted into the fault table, which indicates faults before this code are from an earlier 24 hour time period. If power is removed from the controller, then the current time will not increment.
%R401	%R401	The most recent fault.
	%R402	Status Code for the most recent fault
%R402	%R403	The 2nd most recent fault.
	%R404	Status Code for the 2nd most recent fault
%R403	%R405	The 3rd most recent fault.
	%R406	Status Code for the 3rd most recent fault
%R404 to %R449	%R407 to %R498	The table is repeated for the rest of the fault table.
%R450	%R499	The 50th most recent fault.
	%R500	Status Code for the 50th most recent fault

8.4.4 Fault Log Codes

Code	Fault Description
00	Rollover Code. This Fault Code is inserted every 24 hours to show that the faults before this code were from the previous 24 hour time period.
01	Running Shutdown Timer. The car ran for the time specified by the "Shutdown Time" setting without passing a floor. The car will stop and return to the bottom landing. It is reset by cycling power or cycling the Inspection Switch. The probable causes are: (1) Low oil, (2) Up valve(s) did not operate properly, (3) Pump did not operate properly. Check that the setting of the shutdown timer is long enough for the car to run between floors. The normal shutdown timer setting is 25 seconds.
02	Brake Fault Timer Fault. This fault is for traction elevators only. The Brake Fault Timer monitors the Brake Micro Switch Input, and other run inputs (such as BK1, BK2, P, PZ, or PX contacts) that change state when the car starts or stops. If an input fails to change state properly within 3 seconds of the start or end of a run, then the Brake Fault Timer will trip. Check the wiring and contacts going to the run inputs for proper operation. This fault will shut down the controller, and is reset by cycling power or cycling the Inspection Switch.
03	Drive Reset Fault. This fault is for traction elevators only. The drive has attempted to reset more than the preset number of times (default=4). If the drive runs for 15 minutes without a fault then the counter is reset to zero.
04	Leveling Fault. This fault is for traction elevators only. The Leveling Fault is initiated when the car has been leveling for more than 15 seconds, or if the car is oscillating at the floor, bouncing from up level to down level to up level, etc. The car is not shut down, but will not be able to relevel until the car has run to another landing.
05	Emergency Power. The car went on Emergency Power, if supplied.
06	Door Open Fault. The Door Open Limit Switch failed to open after the doors had been opening for the time specified by the "Door Fault" setting. The probable causes are: (1) The Door Open Limit failure, (2) door operator failure, (3) door control circuitry failure.
07	Door Close Fault. The doors failed to close properly when they were parking, or when the car was ready to run for the next call. This fault will not be caused by keeping the doors open through the normal means (Door Open Button, Safety Edge, Infra-red Unit, etc.), but only if the doors should be closing but were not able to close. The probable causes are: (1) Door Close Limit failure, (2) Door Contacts failure, (3) door operator failure, (4) door control circuit failure.
08	Door Contact Fault. The Door Contact Input turned off while the car was running. This fault could be caused by the car tipping a door contact, or another of the devices in the safety string. It could also be caused by a failure of the "DC" Door Contact relay.
09	Door Zone Fault. The car stopped between floors. This is normal when the car is being taken off Inspection Service. This fault will usually be seen with fault 08, since the car will usually stop outside the door zone if the safety string is broken.
0A	Car Stuck Fault. The car was held at a floor for the time set by the "Car Stuck Time" setting, without running. This may be caused by a stuck button, or by a passenger holding the car.

0B High Speed Counter Fault (If Used)(Available with High Speed Counter cards only). The High Speed Counter detected an over speed condition. Possible faults include exceeding 110% of contract speed; exceeding 150fpm on Inspection; exceeding 50fpm with the doors open; loss of Tachometer signal; tachometer showed the car running the wrong direction. The specific fault will be shown on a fault output indicator, see the schematic for the location of the fault output indicators.

0C Emergency Terminal Slowdown Detection Overspeed Fault. (If Used)(Available with High Speed Counter Card only.) An over speed was detected at a terminal landing. The most recent overspeed fault data is stored in the ETSD fault registers, as described in the ETSD Instructions.

0D Door Check Fault (if used). Door Contacts were closed when the Door Open Limit was broken.

0E Rope Brake Fault (if used). The car moved out of the Door Zone with the doors open. **The Rope Brake Faults (Faults 0E,17,18) are cleared when the Shutdown Defeat Input goes from off to on, with power already on.**

0F Drive Ready Fault (if used). The Drive Ready Input went off.

10 Communication Failure on Duplex. This will occur when the power on the other car is turned off, or the other car fails to communicate properly for 5 seconds. Check the communication wiring.

11 Drive On Fault (if used). The Drive On input went off while the car was running. Check the drive.

12 Up and Down Level Switches were both on at the same time.

13 Earthquake operation was initiated.

14 High Speed Counter OK signal was lost. Cycle the power or replace the High Speed Counter card.

15 Fire Service was initiated from a Fire Sensor or the Fire Sw.

16 Machine Room Fire Sensor tripped.

17 Runaway Fault. Car exceeded 50fpm when it should not be running. This fault trips the Rope Brake. **The Rope Brake Faults (Faults 0E,17,18) are cleared when the Shutdown Defeat Input goes from off to on, with power already on.**

18 Brake Fault. The Brake Micros Sw indicated the Brake failed to drop. This fault trips the Rope Brake. Reset by turning on the Shutdown Defeat Input momentarily. **The Rope Brake Faults (Faults 0E,17,18) are cleared when the Shutdown Defeat Input goes from off to on, with power already on.**

19 Load Weighing Overload was tripped.

1A Rope Brake Check Fault. The Rope Brake contacts failed their self-check, which is performed before every run.

1B Door Zone input stuck on.

1C Redundancy Fault 1. A fault occurred with the Rope Brake or Stop Sw Bypass relays.

1D Redundancy Fault 2. A fault occurred with the Leveling or Running relays.

1E FS Fault. The car tried to run Fast Speed, but did not pass a floor. After 20 attempts, the car will shut down. This can be caused by the FS relays failing to cut out Leveling, or by the car tripping the Door Contacts as the car starts.

1F Redundancy Fault 3. A fault occurred in the Safety String.

20 Redundancy Fault 4. A fault occurred in the Inspection contacts in the Safety String.

8.5 GE Series 90-30 Hand-Held Programmer Instructions

8.5.1 Sequence to Check the Status of a Coil.

1. Install the Programmer. The Main Menu will be displayed. You can return to the Main Menu by pressing MODE.
2. Press 2 ENT, to get into the DATA Mode.
3. Press the letter corresponding to the TYPE of coil to be examined. (Eg: I for Input, Q for Output, M or T for Internal Coil, R for Register).
4. Enter the reference number of the coil to be examined, then press ENT.
5. The desired coil will now be shown on the top line of the display. The value may be shown in Binary, Decimal or Hexadecimal, by pressing the HEX/DEC key to cycle through the choices. Binary is recommended for coils, and Decimal for Registers.
6. A new coil or register may be examined by pressing the Up ↑ or Down ↓ arrow keys to scroll through the tables, or go to step 4 above and enter the desired value directly.

8.5.2 To Change the Value of a Register or Status of a Coil.

1. Display the desired Register or Coil on the top line of the display as shown above. (Registers should be displayed in Decimal or Hexadecimal. Hexadecimal numbers are 4 digit numbers followed by an 'H'.)
2. Press the Right Arrow →. The value will change to a flashing cursor.
3. Enter the new value. If it is a coil, enter 1 for On or 0 for Off. If it is a Register, enter the new value. Repeat steps 1-3 for all values to be changed.

8.5.3 To Reset the Adjustable Values to the Factory Default.

1. Display coil M305, as described above.
2. Turn coil M305 ON, as described above. The coil will immediately be turned off by the program, but while it was on the default values were reset. This includes Door Times, Fire Service Floors, and other timer values.

8.5.4 To Change the DATE/TIME

1. With the power OFF, plug in the GE 9030 Hand-held Programmer.
2. Turn on the power.

3. Put the PLC in the STOP mode.
   a) Press RUN, +/-, +/-, (Display should show “STOP”), ENT
   b) The top right of the screen should show “<S” (not “<R”)
4. Go to the Configuration menu
   a) Press MODE, **4,** ENT
5. Press the Right Arrow ➔ to display the current **month** setting.
   a) Press the appropriate number(s) for the new value, then press ENT.
6. Press the Right Arrow ➔ to display the current **day** setting.
   a) Press the appropriate number(s) for the new value, then press ENT.
7. Press the Right Arrow ➔ to display the current **year** setting.
   a) Press the appropriate number(s) for the new value, then press ENT.
8. Press the Right Arrow ➔ to display the current **hour** setting.
   a) Press the appropriate number(s) for the new value, then press ENT.
9. Press the Right Arrow ➔ to display the current **minute** setting.
   a) Press the appropriate number(s) for the new value, then press ENT.
10. Press the Right Arrow ➔ to display the current **second** setting.
    a) Press the appropriate number(s) for the new value, then press ENT.
11. Put the PLC in the RUN mode.
    a) Press RUN, +/-, (Display should show “RUN”), ENT
    b) Press ENT again if you are asked if you want to clear faults.
12. Press MODE to return to the Main Menu.
13. Unplug the Hand-held Programmer.

9. ETSD Monitoring System Testing

NOTE: When performing these tests, especially while the elevator is on Normal operation, first verify that the car is empty and that Hall Calls are cut out.

9.1 UCM System Testing

9.1.1 When equipped for Rope Brake Operation

1. Power down the system.
2. Remove the controller wire at Input DZ, "Door Zone", on the ETSD Board. Clip this controller wire to a short wire temporarily installed in its place.
3. Power up the system.
4. Run the elevator on Automatic to the top landing.

NOTE: Be sure to take the necessary steps to prevent anyone from boarding the elevator during the test.

5. As the elevator opens its doors at the top landing, remove the controller wire clipped to the temporary wire at Input DZ on the ETSD Board.
6. The UCM System will cause the "UCM TRIP" LED to light and the Rope Brake to set.
7. Power down the system.
8. Restore the controller wiring at Input DZ.
9. Power up and briefly touch a wire from controller TB-1 (120VAC Hot) to Input SHTDFT on the ETSD Board to reset the UCM System and the Rope Brake.

9.1.2 When equipped for Emergency Brake Operation

1. Run the elevator on Automatic to top landing.

NOTE: Be sure to take the necessary steps to prevent anyone from boarding the elevator during the test.

2. Power down the system with the doors closed.
3. Remove the field wires at controller TB's: 21 & 22, Up & Down Leveling Switches. Temporarily place a short wire in TB-22.
4. Power up the system.
5. Briefly touch a wire from controller TB-1 (120VAC Hot) to controller TB-27, Door Open Button Input, to open the elevator doors.
6. With the doors open, clip the wire from controller TB-1 to the short wire just installed at controller TB-22, Down Level Switch.
7. The elevator will level down slowly until it rides out of the Door Zone.

8. UCM System will cause the “UCM TRIP” LED to light and the Emergency Brake to set.
9. Power down the system.
10. Restore the field wires at controller TB’s: 21 & 22, Up & Down Leveling Switches.
11. Power up the system.
12. Touch a wire from TB-1 of the controller to Input SHTDFT of the ETSD Board to reset the UCM System and Rope Brake.
13. The elevator will close its door and relevel back to the floor.

9.2 O-S System Testing

1. With car at mid-hatch, place elevator on Inspection Operation from controller.
2. Power down the system.
3. Install a jumper from controller TB-1 to controller Input or TB: “SHTDFT”. See the controller drawings for the location of this input or terminal.
4. Power up the system.
5. Set the drive for an Inspection Speed of 175fpm and run car.
6. The O-S System will fault causing the “O-S TRIP” LED to light and stop the car.
7. Power down the system.
8. Remove the jumper from controller TB-1 to Input or TB: “SHTDFT”.
9. Power up the system.
10. Restore the drive to its original Inspection Speed.
11. Use the “O-S RESET” Push Button on the ETSD Board to reset the O-S System.
12. Restore elevator to Normal Operation.

9.3 ETSD System Testing

1. With car at mid-hatch on Normal Operation and at floor level, power down the system.
2. Install a jumper from controller TB-1 to controller Input or TB: “SHTDFT”. See the controller drawings for the location of this input or terminal.
3. Remove the field wire from controller TB-31X, Up ETS Switch, and clip this field wire to a short piece of wire temporarily installed in its place.
4. Power up the system.
5. Set a Car Call in the Up Direction that causes the car to run multiple floors at contract speed.
6. Monitor car speed by observing Relay Output LED’s: “EX1 & EX2”.

7. When these LED's go out, remove the field wire clipped to TB-31X.
8. The ETSD System will fault causing the "ETSD TRIP" LED to light and stop the car.
9. Power down the system.
10. Remove the jumper from controller TB-1 to Input or TB: "SHTDFT".
11. Restore the field wire at controller TB-31X, Up ETS Switch.
12. Power up the system.
13. Use the "ETSD RESET" Push Button on the ETSD Board to reset ETSD System.
14. The elevator will level to a landing on Normal Operation.
15. If desired, repeat steps in Down Direction using TB-32X, the Down ETS Switch.

10. Troubleshooting Suggestions

Refer to the GE Series 90-30 Programmable Logic Controller (PLC) Installation Manual #GFK-0356 for a complete description of hardware. Page numbers may vary depending on the revision date of the manual.

Before applying power to the programmable controller, verify that the voltage to line 1 and 35 is 110-125VAC. When power is turned on to the programmable controller the Power, OK and Run lights on the Power Supply should come on. The program memory is PROM (Programmable Read Only Memory), so does not require the battery to maintain it. The battery is required to hold some retentive coils in the CPU during a power failure. The battery has a life of between 2 and 5 years. When it is about to fail, the battery light on the power supply module will go on. The battery should now be changed as described in the GE manual (page 3-7).

To provide proper warning of a failing battery, the controller may turn on or flash the shutdown output when the battery is low. This output may be used to alert building personnel that the battery should be changed. When the controller power is off, the battery will drain quicker than if the power is on, so it is recommended that the controller power be left on whenever possible.

Field connections should be in accordance with the user's manual (page 3-39). Refer to the Virginia Controls schematic to determine which wires are connected directly to the I/O modules, and which are connected to terminals.

NOTE: It may be easier to connect the field wiring with either the module or the terminal board removed. (see pages 3-34 to 3-39)

NOTE: It is essential that all wiring is connected to the correct Input or Output point. It may be necessary to temporarily remove a factory wire from one of the I/O modules when connecting the field wiring. If this is done, be sure to return the factory wire to the correct place.

NOTE: The terminal numbers do not correspond to the Input/Output reference numbers. The schematic shows the terminals and the reference numbers. The indicator lights show the input/output reference numbers. The top line of lights is for Group A Inputs/Outputs, the bottom line is for group B Inputs/Outputs. See the schematic or module label to match the input/output number to the proper terminal number.

Refer to the GE Installation Manual Chapter 3 for maintenance and troubleshooting procedures. Troubleshooting is similar to any other controller, and has several features to speed up determining the cause of any problem. No special knowledge of the operation of the PLC is required to be able to troubleshoot it. A hand-held programmer is useful but not essential for troubleshooting.

A safety relay interface is provided to prevent dangerous operation due to a failure of the PLC. It is possible that the PLC may turn on an output point, yet the field safety switches may prevent the associated device from energizing. For example, if the up run output energizes, but the up normal switch is open, then the up run valve(s) will not energize.

10.1 Locating Faults

Once the system has been installed, and is running properly, the most common problem will be the failure of an external device. The first step in locating the cause is to determine whether the fault is in the Microprocessor or whether it is in the external wiring.

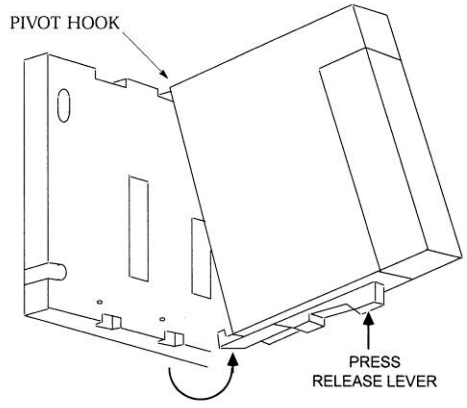
For example, if a position indicator light is not lit, check the output module for the appropriate output point to determine if the Microprocessor is trying to turn the light on or not. If the output light is on, then confirm that there is voltage at the module terminal. If there is voltage at the module terminal, then the problem is external to the Microprocessor. It could be in the wiring to the position indicator, or perhaps the position indicator light has burned out. Similarly with input points, check that the input module light is on, that there is power at the terminal, and if not then the problem is external.

If it is determined that the problem is with the PLC, then the terminal block can be unplugged from the module, and a new module should be installed in its place. If this does not correct the problem, the Power Supply, Rack or the CPU module could be faulty. If the CPU fails, it will probably turn off its "Run" or "OK" light, due to internal checking features. The CPU and other modules can be affected by high transient surges in the power supply, such as the building being hit by lightning. This may damage the CPU, or alter the contents of the program. Proper grounding will protect the controller from most of these problems.

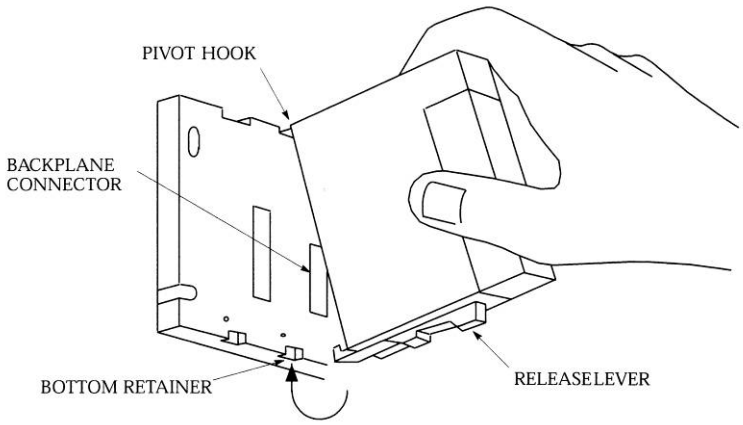
10.2 I/O Board Removal (GE Series 90-30)

WARNING: When replacing a board, the same type of board must be used to match the old board. Check that the replacement board has the same part number as the old board.

To replace an I/O board, unplug the terminal block. Press the lever at the bottom of the module, and pull the module forward and out. Install the new module by reversing the above steps. Refer to the user's manual (pages 3-34 and 3-35) for additional information on the proper procedure for removing input or output cards. If an Input or Output Module fails, it may be possible to temporarily replace that defective module with another module that is used for non-essential functions (such as call register lights), thus providing elevator service while a replacement module is being obtained.



Removing a Module



Installing a Module

NOTE: The Input and Output modules must be installed in the correct slots. The schematic indicates where each module should be located. Though Input modules may be changed with other Input modules of the same type, and Output modules changed with other Output modules of the same type, an Input module must never be put in a slot allocated for an Output module, and an Output module must never be put in a slot allocated for an Input module.

10.3 Factory Assistance

IMPORTANT: IF TROUBLESHOOTING ASSISTANCE IS REQUIRED FROM VIRGINIA CONTROLS, GET THE FOLLOWING INFORMATION BEFORE CALLING (ADDITIONAL TROUBLESHOOTING INSTRUCTIONS MAY BE GIVEN, DEPENDING ON THE NATURE OF THE PROBLEM):

- **THE VIRGINIA CONTROLS DRAWING NUMBER** (located at the bottom right of the schematic).
- **AN EXACT DESCRIPTION OF THE PROBLEM.**
- **THE STATUS OF ALL THE INPUT AND OUTPUT POINTS.**
- **THE STATUS OF THE LIGHTS ON THE POWER SUPPLY.**

11. Controller Maintenance

WARNING: MAKE SURE THE POWER IS OFF BEFORE CONNECTING OR DISCONNECTING ANY CONNECTORS, MODULES OR CABLES ON THE PLC OR I/O BOARDS.

11.1 CPU Module Exchange

To swap out a CPU module:

1. Turn off the power to the controller.
2. If the system has as separate CPU module, press the release lever on the bottom of the module to remove the module. Swing it out, and put in the new CPU module by reversing the procedure.
3. If the system has a CPU in the rack, then remove all modules, including the Power Supply. Unbolt the rack, and replace it with the new rack. Re-install all the modules.

11.2 EPROM Memory Exchange

WARNING: IF YOU NEED TO CHANGE THE EPROM PROGRAM CHIP ON THE CPU BOARD, MAKE SURE YOU READ THE INSTRUCTIONS AND KNOW EXACTLY HOW TO INSTALL THE NEW CHIP. PLUGGING THE EPROM IN UPSIDE-DOWN MAY DAMAGE YOUR CHIP. STATIC ELECTRICITY CAN DAMAGE THE EPROM, SO AVOID TOUCHING THE PINS ON THE CHIP, AND GROUND YOURSELF (BY TOUCHING THE CONTROLLER CABINET) BEFORE TOUCHING THE CHIP OR THE CONTROLLER. DO NOT EXPOSE THE EPROM PROGRAM CHIP TO BRIGHT LIGHT, AND DO NOT REMOVE THE LABEL OVER THE EPROM PROGRAM CHIP WINDOW.

To exchange the EPROM memory chip on the CPU board:

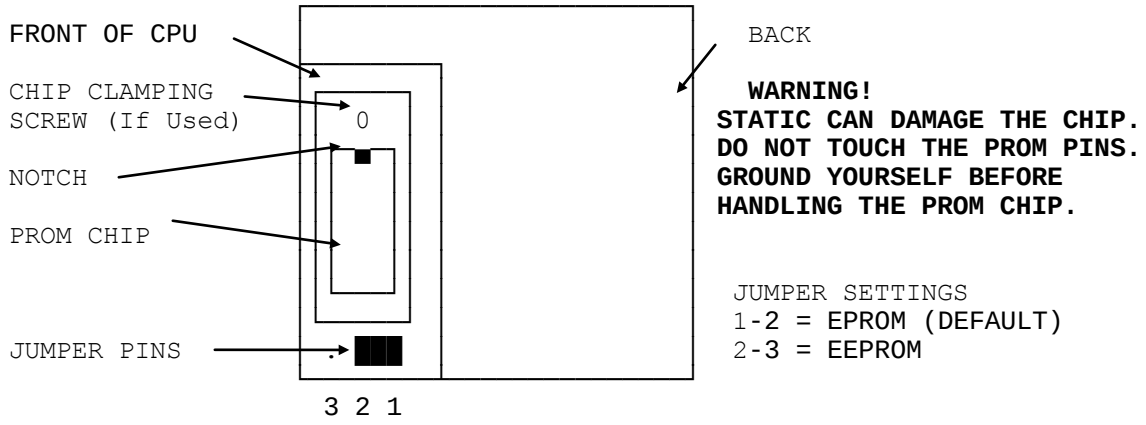
1. Turn off power to the controller.
2. Locate the EPROM chip. On systems with a separate CPU module, remove the CPU from the rack and remove the cover from the front of the CPU. The EPROM chip is behind the front cover on the CPU module. On systems with a built in CPU in the base, remove the three modules to the immediate right of the power supply, (the terminal blocks may be removed to make it easier to remove the modules) and locate the “Program EPROM”, which is the EPROM to be changed.

WARNING: Do NOT remove the System PROM.

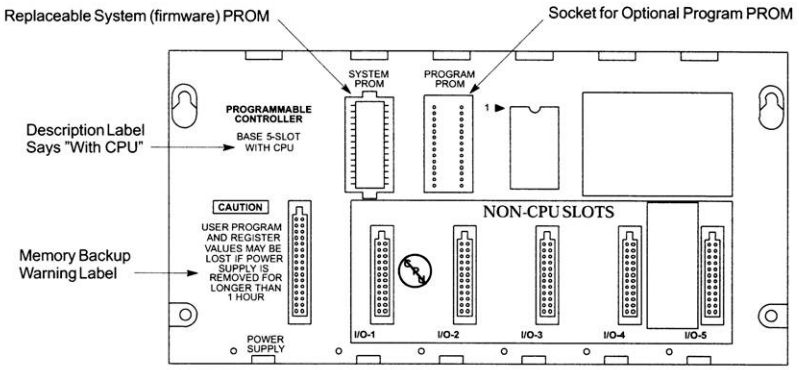
3. Using a small screwdriver, or other appropriate tool, pry out the old Program EPROM chip by inserting the screwdriver between the chip and its socket. Gradually work the chip out, trying to avoid swinging it out, which would bend the pins at one end, but rather prying it straight out by working the screwdriver under the chip from both ends.
4. Insert the new EPROM chip by orienting it properly, so that the notch is at the top, to match the socket, and all the pins line up with the socket. It should not be necessary to use force to insert the EPROM chip, but apply slight sideways pressure to line up the rows of pins with the holes in the socket, and then evenly press the EPROM chip into place.

5. Do not apply power until the orientation of the chip has been checked. Also verify that ALL pins are properly in the socket, and that none of them have been bent out of place.
6. Replace any modules that were removed to get to the EPROM chip. To replace a module, hook the catch at the top of the module, then swing in down to latch it
7. Turn the power back on. The new program is automatically loaded when power is applied, and the "OK" and "RUN" lights should come on. If the "RUN" light on the CPU fails to come on, then check the ORIENTATION of the PROM chip in the socket. If a Hand-Held Programmer is available, install it, and then follow the instructions in the GE Manual to start the CPU. If the CPU still does not come up in the RUN mode, then the PROM chip or CPU could be miss-matched or defective. Call Virginia Controls for assistance. Please write down the CPU model number (GE # IC693CPU3??), the program number on the front of the PROM chip, and the status of the lights on the front of the CPU.
8. It may be necessary to reset the factory default settings. Check the instructions provided with the EPROM chip. To Reset Factory Default Settings, (Fire Return Landings, Door Time, etc.): Turn off the power. Put the car on Inspection (or remove field wire 23). Jump terminal 1 to terminals 21 and 22. Turn on the power. After the run light comes on for 10 seconds, turn off the power. Remove the jumpers. Turn on the power.
9. Verify the operation on Inspection, then Automatic, BEFORE allowing passengers on the car.
10. Return the old chips to Virginia Controls within 10 days. Use the plastic holder that the chips were sent in, and make sure they are carefully packed to avoid damage to the pins. The chips should be marked with the Return Authorization number shown on the paperwork with the new EPROM chips.
11. See the instruction sheet that came with the new EPROM chip for SPECIAL INSTRUCTIONS, if required.

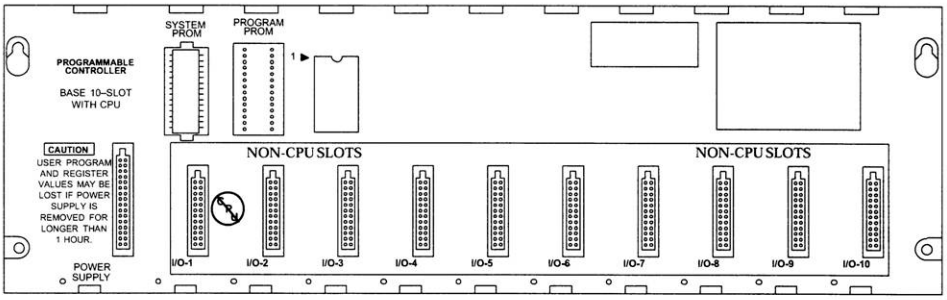
SEPARATE CPU MODULE showing PROM CHIP LOCATION



CPU RACKS showing PROM CHIP LOCATION



Models IC693CPU311 and IC693CPU313 (5-Slot) Embedded CPU Baseplates



Model IC693CPU323 (10-slot) Embedded CPU Baseplate

Figure 82 - GE Series 90-30 Embedded CPU Baseplates

11.3 Input/Output Board Exchange

To exchange on Input or Output board:

1. Turn off the power.
2. Remove the terminal block from the module to be replaced.
3. Remove the module by pressing the lever on the bottom of the module, and swinging the module up.
4. Install the new module by reversing the previous steps.

12. Frequently Asked Questions

Suggestions for other Frequently Asked Questions are welcomed. Please submit them to Chris Wilson at Virginia Controls.

12.1 Questions on Field Devices

Q. Are the Reset Targets necessary when using a pulsing selector?

Yes. The reset targets are required at the terminal landings, as shown on the car top selector installation sheet, to establish or reset the floor position at the terminal landings.

Q. Why are Two Position Indicators energized at the same time?

With Floor Switches, if there is an overlap of the slowdown targets, or a Floor Switch sticks on, then when the car hits a new Floor Switch, all floors that have a Floor Switch input energized will be turned on. The floor position corrects when the car hits the next Floor Switch.

If the problem happens intermittently, it is probably caused by a sticking Floor Switch. If it happens regularly at a particular floor, there is probably an overlap between Floor Switches. In this case, separate the Floor Switches (or targets) so there is no overlap.

12.2 Questions on the Controller

Q. How Do I Reset All Settings and Features Back to the Original Values?

1. Turn off the power
2. Turn the Inspection Switch to "Inspection" (or remove the field wire from terminal 23)
3. Jump terminals 1 to 21 and 22 (Up and Down Level Sw Inputs)
4. Turn the power back on for 10 seconds. Inputs A1 and A2 should both be ON, and Input A3 should be OFF.
5. Turn off the power
6. Remove all jumpers and put the car back on normal operation.

Q. How do I check the current values of the settings and features?

1. Install a hand-held programmer, or computer running GE Logicmaster software.
2. Press 2 ENT, to get into the DATA Mode.
3. Press R and the register number that you want to check, then ENT. Check the schematic, sheet "FEATADJ" to see the register value for the function you want to check.
4. Press HEX/DEC to change the display mode (Decimal/Hexadecimal/Binary)
5. The register will be shown on the left, and the data in that register on the right of the display.

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